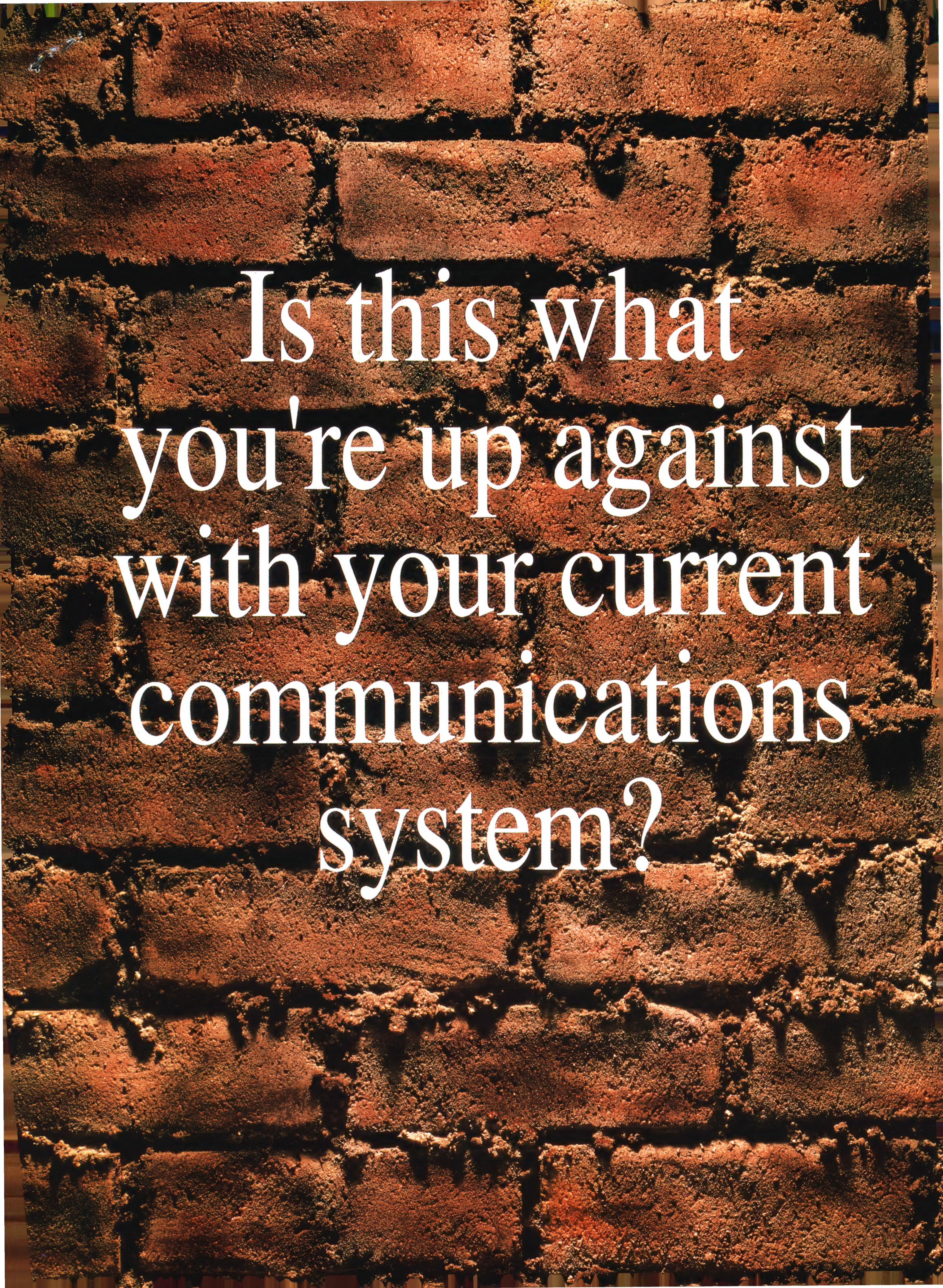
AUSTRALIAN

communications

JUNE 1993 The Data and Telecommunications Management Magazine $5.50

LOOKING OUT FOR OUR BOOMING EXPORT INDUSTRY

- WINDOWS NT
- GSM UPDATE
- APPN AND TCP/IP
- DEC'S STRATEGY



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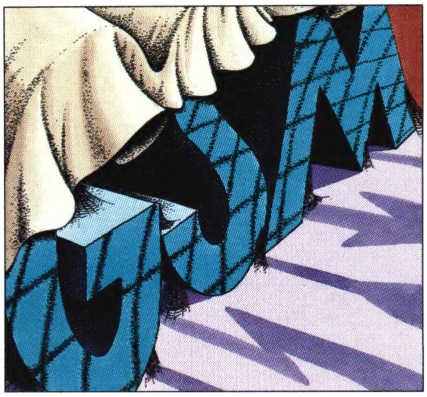

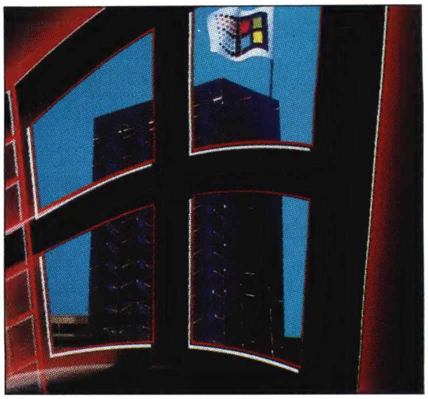

AUSTRALIAN EXPORTS 61

Over the past four years, Australia's telecommunications exports have quadrupled from $87 million in 1988 to $360 million in 1992. The target now is to achieve exports of $2 billion per annum by 1998, but what strategies are in place to bring this about? Bernard Levy explores the issues occupying the minds of the 'wise men's club' in Canberra: How effective are government export incentive programs, and how much real assistance does Austrade deliver to exporters? Is the export market, particularly the Asian region, changing so rapidly that Australian policy makers are out of touch with regional realities? Will Telstra's changed status from benevolent monopolist to hungry competitor be to the detriment of our exporters?

GSM 73

After an embarrassing delay, Australia has now entered a new era in mobile communications with the launch by Telecom and Optus of their GSM networks. Developed over a long period, GSM is still considered by many to be an immature system, and it won't reach its full potential until the release of GSM Phase 2 in a few years time. However, given the delays introduced by even the cut-down GSM Phase 1 testing procedure, the need to retain Phase 1 compatibility, and the problems that must arise through slight variability between existing cellular mobile and base station implementations, it looks like there may be even more introduction problems ahead. In the first part of an extended look at digital mobile technology, Stewart Fist examines the status of GSM.

WINDOWS NT 81

Microsoft's Windows NT has network managers in a state of denial: Some are hoping that it will go away, while others are counting on Microsoft's tradition of buggy first releases to put a damper on on demand for the time being. But Bill Gates and company are determined to make Windows NT the unquestioned leader in distributed computing. NT is built from the ground up as networking platform, with built-in file and print sharing, APIs, and support for TCP/IP and RPCs. Microsoft has even gone so far as to make NT conform to an existing standard (Posix) and to define an SNMP management information base for it. But a hands-on review of a beta version of NT shows that Microsoft has a long way to go to meet its ambitious agenda.

JUNE 1993

APPN 89

While TCP/IP may currently be the favoured architecture for building enterprise networks, IBM's new Advanced Peer-to-Peer Networking offers users some powerful features that TCP/IP simply can't match. APPN meets the most important criteria for enterprise networking — allowing large and small computers to communicate as peers across local and wide area links at a range of different data rates, regardless of network size. It also has an extensive set of directory, session, presentation, configuration, management, and security services, and can be accessed by a powerful set of application interfaces that help users take full advantage of the range of network services. But despite all these strengths, IBM is going to have difficulty selling APPN as the heir to SNA, especially with TCP/IP available now in real products.

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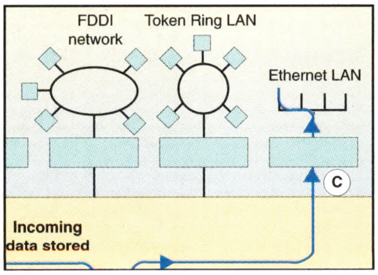

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Proteon's CNX 600 high performance multiprotocol router dispenses with conventional bus architecture.

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A new chassis combined with support for SNMP and FOIRL provide a boost for Kalpana's EtherSwitch.

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Datacraft has released its new Australian-designed and built AP 4000 multiprotocol router family.

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59 Dr Chris Beare, a Director of Hambros merchant bank, casts a close eye over the proposed Australian National Fibre Optic Project.

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53 Clem Doherty
A Director of the Australian office of McKinsey and Company, and a leader of the firm's Asia Pacific Telecoms Practice, Clem Doherty has an international perspective on telecommunications deregulation.

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49 Has Austel Dropped the Ball?
The performance of industry regulator Austel in fulfilling its pro-competitive mandate has come in for a barrage of criticism over the past few months. Peter Leonard examines the reasons why.

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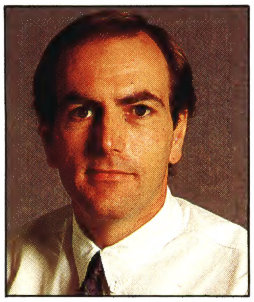
The Export Drive



According to AEEMA, last year Australian manufacturers exported telecommunications equipment to the value of $360 million, up 25% on the year before and 70% above the target set in 1986 by the Communications Equipment Export Strategy.

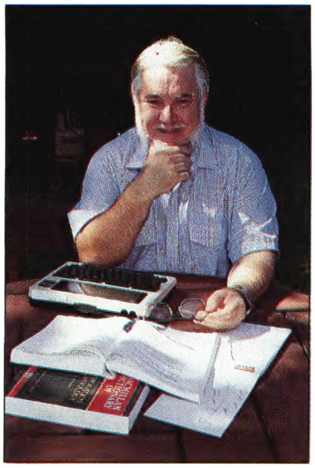
This is obviously good news for both the industry and the country, so let's hope the trend keeps going upwards. The goal set in 1986 was to achieve exports of $600 million per annum by 1996. But, buoyed by the industry's growth and the enormous market growth potential in the Asia-Pacific region, this goal was perhaps a little over-optimistically revised upward to $2 billion by 1997.

Is it achievable? Perhaps the most encouraging thing is the will right across government and industry to make sure that this is not another opportunity Australia misses. This is reflected in the creation of the Telecommunications Export Task Force (TETF), the Telecommunications Industry Development Authority (TIDA) and the energetic and pro-active role played by AEEMA. Also on the positive side of the ledger is the industry's relative diversity. There are many small to medium sized firms offering a wide range of goods and services now actively addressing export markets. Unfortunately, the other side of the coin is the fact that together, these firms are as yet very small exporters in dollar terms. Take out Alcatel, Ericsson, Siemens, Exicom and maybe a few others, and the $360 million would shrink dramatically.

But the real engine of growth if the export target is to be reached is Telstra. The corporation now has its own stated goal to derive something like 10% of its revenues from offshore within five years, perhaps equivalent to some $1.5-$2 billion by 1998. If that happens, then the pull-through effect for Australian industry will be substantial and the $2 billion export goal would seem considerably less distant.

You don't have to be an economist to realise that Australia needs to develop high technology industries and boost its export performance. If, through the communications industry, there's a chance of assisting both aims at the same time, then it should be pursued with vigour and vision. So let's hope that recent calls from Optus for Telstra to spend less money investing overseas and more at home are not taken too seriously.

M A Smeaton



Stewart Fist Communications Journalist of the Year

Stewart Fist was named as ATUG's Communications Journalist of the Year at last month's ATUG'93. ATUG Executive Director, Wally Rothwell, said the Journalist of the Year award is judged on the basis of each candidate's contribution to the communications industry. He praised Stewart for his knowledge of the communications environment as a whole, the thoroughness of his research and his exceptional ability to make complex subjects understandable.

A highly valued contributor to *Australian Communications*, Stewart was also named Technical Writer of the Year in 1990 by the judges of the Hewlett-Packard Computer Journalism Awards.

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Telecom Stalls on Ballot Campaign

Telecom last month formally requested Austel to arbitrate in its dispute with Optus Communications over the style and cost of the upcoming preselection ballot public-awareness campaign. The request follows an agreement reached in early May by the two carriers on the basic arrangements for the preselection process.

Valued at an estimated $5 million, the ballot public-awareness campaign was originally to be jointly funded by the carriers. However, while Optus was reportedly keen for the campaign to feature a high profile advertising blitz, Telecom held out in favour of a more low key approach on the grounds of cost, despite the fact that the carriers are expected to spend over $100 million on advertising between them this year.

In a joint statement issued on May 6, Austel, Telecom and Optus announced the arrangements for the ballot, which is scheduled to commence in Melbourne and Sydney between July 15 and September 1, and in Canberra between July 15 and September 28. Other areas will follow after the Optus Dial 1 service has been established.

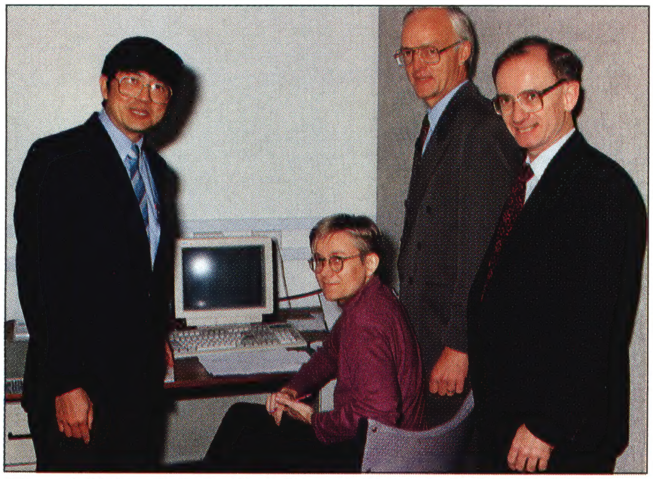
Telephone subscribers will receive a ballot form in the mail, together with a reply paid envelope, and have 30 days to respond. Those who choose not to respond will remain Telecom customers by default, although each subscriber will be able to access either carrier by dialling an override code code (1456 for Optus and 1411 for Telecom). An independent administrator will be appointed to manage the ballot process.

Communications R&D Boosted

Australian R&D into next-generation communications technologies received two small but significant funding boosts in Victoria and NSW recently.

Aided by a $1.3 million grant from the IR&D Board, staff from Siemens, Monash University, Telecom Research Labs and the Australian Computing and Communications Institute will collaborate in a project intended to help define, develop and demonstrate advanced BISDN user services. The Video Based Telecommunications Services Project will build on the work undertaken by substantially the same research team in developing a universal video codec.

In NSW, the State Government has provided $240,000 for a Product Incubator Laboratory at the Australian Photonics Cooperative Research Centre at Sydney University. The lab will support development activities in mechanical and electrical design, and the fabrication of optical fibre prototype devices.



Monash University's Dr Khee Pang (left), Lindy Dekker and Professor Fred Symons with Siemens' Dr Ockert Van Zyl (second from right)

Optus Critical of Telecom, Austel

Optus CEO, Bob Mansfield, has warned Telecom against becoming too emotionally involved in the battle for customers' hearts, minds and wallets, and criticised Austel's recent decision to allow Telecom to retain 0015 international fax access code.

He also said Telecom should focus less on overseas markets and spend more money upgrading the telecommunications network in Australia, so that all providers would be able to offer the best possible service.

Mansfield made the comments during a speech to around 1,000 delegates at the ATUG'93 conference, held in Darling Harbour in May.

During the speech, he quoted from a paper by Dr Joseph Kramer, an industry consultant with Washington-based Deloitte & Touche, which discussed the tendency for dominant carriers to respond too emotionally to loss of market share, resulting in unfocused marketing strategies and even unethical and illegal conduct aimed at frustrating competition.

He stressed that competition in the telecommunications market would benefit everyone — carriers, customers and service providers — and cited as an example the divestiture of AT&T, saying competition had benefited the company by making it shed its complacent, sluggish culture, while at the same time increasing its revenues because of growth in the industry.

Speaking about the Austel 0015 decision, Mansfield said "the only people more surprised by Austel's decision to allow Telecom to retain the international code were Telecom themselves." He added that Telecom had proposed a compromise deal, where both carriers would have been allocated new numbers, but said that Austel had rejected this solution.

DoD Switches on DATN

Telecom claims the Department of Defence is achieving savings of 36% following the implementation in late April of the first phase of the Defence Automatic Telephone Network (DATN).

A high-integrity digital national virtual private network, the DATN is being managed in two phases to ensure ease of integration with an existing DoD private telephone network along the east coast. Phase One has encompassed the connection of DoD's 122 PABXes in WA, SA, NT and Tasmania as a virtual private network, with outgoing call access to all Defence PABX sites throughout Australia.

Director General Joint Projects Management, Brigadier Neil Horn, said the new network was a collaborative effort between the Department and Telecom, and would provide cohesive, seamless and more reliable communications for Defence personnel.

NEC Signs $10m Deal with Fiji P&T

NEC Australia has announced it has signed a five-year contract worth $10 million with Fiji Post and Telecommunications (P&T) for the supply of NEC's NEAX 2400 PABX systems, key telephone systems, Voicepoint audio conferencing equipment, and training.

The contract is the result of an aggressive push by NEC Australia to win new export markets in the Asia Pacific region for its PABXes, microwave optic transmission systems, cellular products,and key telephone systems.

Fiji's largest businesses, government departments, luxury hotels and essential services will all benefit from the new technology, an NEC spokesperson said.

Under a technology transfer agreement, Fiji P&T technicians will train with NEC engineers at the firm's manufacturing site at Mulgrave in Victoria.

AAPT Makes Strong Gains

Fledgling telecommunications company, AAP Telecommunications, is poised to become one of the major players in the Australian market. The company is reported to have generated $23 million in revenue at the beginning of this year, after losses of $8.5 million for its first full year of operation.

AAPT provides customers with enhanced business telecommunications services by reselling capacity purchased from the other carriers. The firm's CEO, Barry Wheeler, told *Australian Communications* he was "extremely satisfied with [the company's] performance."

Mr Wheeler added that the $8.5 million loss was incurred in the period before AAPT offered pre-switched access, which was introduced late last year. "Since we introduced pre-switched access we have made considerable gains in the lower-end, high volume segment of the market, selling our product to businesses that don't need to make a large number of long distance calls," said Mr Wheeler.

Telstra Wins NZ GSM Licence

Telstra Corporation last month successfully bid for the right to establish, operate and manage a GSM network in New Zealand. Telstra submitted a tender of $NZ13 million for the right to one of two GSM mobile telephone networks, TACS B. The other GSM network, TACS A, is owned by BellSouth, which is expected to launch its service very soon.

Four other companies are believed to have submitted competing tenders for the network. They were: Shellion Ltd, Vodafone, Trusting Farm, and BellSouth. A Telstra spokesperson said the details of the new operation, including equipment suppliers and possible mobile service launch date, were yet to be determined. He said the company would probably trade as Telstra New Zealand.

Both Telecom Australia and Optus launched their Australian GSM networks in the last few weeks, despite some last minute panic by security organisations regarding their inability to intercept calls made on the network.

Anixter Sets Up Australian Office

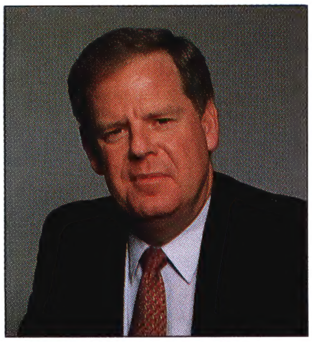
Anixter International last month launched its Australian operation with the opening of a new 2,500 sqm office and warehouse complex in the Sydney suburb of Waterloo.

Anixter is the world's largest distributor of LAN wiring products, with 3,200 staff and worldwide sales of over $2 billion.

Anixter's Australian Managing Director, Jim Steward, said the Sydney warehouse holds $4 million worth of stock, which is managed by an inventory control system linked to an IBM mainframe in Chicago. With around 2,600 terminals worldwide, Anixter staff can instantly get details on its $350 million worth of products held in 100 warehouses around the world.

"We are able to guarantee shipment of 98% of all orders within 24 hours," said Mr Steward, adding that the company expects to turnover more than $10 million in revenue in its first year of Australian operations.

The company was established in 1957, and was the first distributor of SynOptics products. Today, it also distributes products from AT&T, IBM, Digital, Belden and others. It has also opened a branch office in Melbourne, and plans offices in Canberra and Brisbane.



Jim Steward

In Brief

Unisys has won a contract to supply a $3 million X.25 packet switching network to Advance Bank. The network will be based on Unisys and Cray Communications technology, and will be used to improve transaction response time.

ADC Telecommunications, a major American manufacturer of communications and networking equipment, has announced its entry into the Australian market. The Australian operation is the company's first in the region, and will be based in Sydney.

Webster Computer has sold 15 Multigate routers to the University of Western Sydney Nepean, to solve long-standing connectivity problems within their Apple Macintosh network. The University had tried routers from other vendors, with only limited success. The Australian product is reported to be working well.

Infotron has announced first quarter results for the calendar year 1993 which are 30% ahead of target. It has also just completed Australia's first frame relay network, which links the different operating networks of Lend Lease Corporation.

AAP Telecommunications has added the Australian subsidiary of shipping firm P&O to its client base. P&O will utilise a number of private lines leased from AAPT, connecting the company's main offices in Sydney and Melbourne, divisional centres, and regional offices throughout Australia.

MM Cables has announced the appointment of a new General Manager for its Energy Products division. Mike Crompton was formerly Manager, Construction with the firm.

Telstra has presented two Australian telecommunications students with awards which have a combined value of over $50,000. Craig Watkins, of the Australian National University, and Ashley Robinson, of the University of Queensland, were the recipients.

Telecom's Discovery on-line service will be retained, but will get a revamp. Telecom Enhanced Services General Manager, David Rolls, said Discovery's user base is growing again after a period of decline, partly due to reductions in the cost of the service.

MPA International has announced its appointment as a distributor of Digital Equipment Corporation's range of networking products. The company will handle DEC's DEChub 90 family of hubs, as well as its Ethernet cards.

Microsoft has announced a 39% growth in revenues for its Australian subsidiary for the nine months ended March 31, compared with the same period last year. Australian MD, Gary Jackson, said the results reflected the popularity of the company's Windows product, and the continued success of MS-DOS.

Optus Communications mobile telephone customer, Murray Cook, received a surprise birthday present when he signed up with Optus Mobile on his 35th birthday. As Optus' 100,000th mobile customer, Mr Cook received a one-week all-expenses-paid holiday for two at Orpheus Island, and had the cost of his mobile telephone refunded by Nokia.

Saturn Global Network Services has signed a deal with Hong Kong Telecom for the joint operation of international private leased services between Australia and Hong Kong. SGN says it will use Hong Kong to launch a push into other Asian markets.

CompuServe Pacific has announced that connection to its service is now available through Telstra Corporation's Austpac service. This will be of particular benefit to CompuServe members living outside major cities, who will no longer have to make STD calls to the nearest Fujitsu network node.

Pakistan's Prime Minister, Mr Nawaz Sharif, said the new optical fibre cable system installed by Telstra's International Business Unit between Karachi and Islamabad will play an important role in the economic and industrial development of the country. The cable extends along the Indus River valley via 12 major cities.

Apple's MD, David Strong, speaking at ATUG'93, called for the establishment of a high-level industry forum to ensure that Australian companies are ready to exploit the opportunities that will arise through multimedia and the convergence of telecommunications, computing, consumer electronics, office product, broadcasting, publishing and entertainment technologies.

In Brief

AT&T and Sprint have filed complaints with the FCC to block BT's application for a US operating licence. The US carriers say access to the US market by foreign operators should be accompanied by reciprocal and equivalent access by US carriers to the markets of the foreign operators. Sprint's application for a UK licence in January 1992 still has not been granted.

AT&T is to supply Japan's Nippon Telegraph and Telephone (NTT) with 5ESS-2000 switches for its operator services network. Switches will be installed in each of NTT's major regions.

France Telecom and BT have agreed to install a six pair fibre optic cable through the Channel Tunnel. Four of the fibre pairs will be equipped to transmit at 2.4Gbps from 1994.

Belgian bank, Generale de Banque, is one of the first companies to receive invoices for telecommunications services from Belgacom electronically. Transmission of the invoices is carried out according to the international Edifact EDI standard.

ETSI has elected its new General Assembly Chairman. He is Dr Antonio Castillo of Spain, who is currently Director of Networks and Services for Telefonica Investigacion y Desarollo, an R&D subsidiary of Telefonica. He will hold the position for the next two years, and replaces Mr Attilo Gnetti of Italy's Stet.

Philips and ECI Telecom have won a contract to install 52 optical rings in 34 local German telecommunications networks. Deutsche Bundespost Telekom has ordered the SDH equipment after successful trials in Cologne and Hanover. The contract is worth over DM120 million, and must be fulfilled by the end of 1994.

SynOptics has announced record revenues of $US152.7 million for the first fiscal quarter, ended April 2, 1993. The results represent a 17% increase over the prior quarter, and a 12% increase over the same quarter last year. Net profit after tax was $US21.88 million, up 334% over the comparable quarter in 1992.

Iridium investors will need to come up with more money in a second round of financing if they want to retain their seats on the board, according to sources. They confirmed that a consortium of four Japanese companies led by DDI was to take a 15% stake, and said the other investors would be made known before July.

Inmarsat, the 67 satellite communications cooperative, has announced it may use Iridium's satellite cellular technology as the basis for a new hand-held communicator. Inmarsat is currently working with Finland's Nokia and Sweden's Telefon LM AB Ericsson to design handsets for the system.

AT&T has bought UK firm Shaye Communications, the Winchester-based spin-off from Sir Clive Sinclair's technology fountain, which was one of the pioneers of CT-2 telephony.

Ericsson has won a $US300 million contract to supply AXE-10 switching and transmission equipment to China's Guangdong Posts and Telecoms Ministry between 1993 and 1995. This follows the awarding of China's largest ever cellular contract, worth $US150 million, to Ericsson earlier this year.

Ascom Timeplex has officially announced its entry into the outsourced network management market with a service called the Enterprise Network Management Centre. The service is based on two 'logical competence centres' based in Clearwater in the United States and Langley in the United Kingdom.

Energis, the UK National Grid subsidiary, has awarded $US40 million contracts to Northern Telecom and Digital Equipment Corporation to supply systems and supporting technology for its alternative national UK telecommunications network.

Germany and Turkey will discuss cooperation to develop telecommunications in the former Soviet states of Kazakhstan, Turkmenistan and Uzbekistan. German telecommunications Minister, Wolfgang Boetsch, and his Turkish counterpart, Yasar Topcu, recently held discussions on the issue.

Philips Communication Systems has won a DM3.2 million contract to supply Telecom Argentina with a network based on PDH (plesiochronous digital hierarchy) technology. The transmission contract follows the adoption in March of its SDH (synchronous digital hierarchy) systems by Sprint in North America.

EC Endorses Telecoms Liberalisation

EC telecommunications ministers have approved a plan to apply Open Network Provision (ONP) conditions to the voice telephony sector. At their May 10 meeting, they heard EC officials present a plan to introduce competition in voice by 1998.

Ten countries endorsed the proposal, but Spain and Portugal opposed the dispute settlement procedures, arguing for implementation to be controlled by member states. They failed to sway their peers, however, and disputes will be handled by a committee organised by the EC.

The French managed to get a clause inserted in the agreement allowing regional authorities to be included in the process of tariff rebalancing. Greece argued that liberalisation be postponed for two years, while Belgium also called for a delay on the grounds that small operators like Belgacom cannot compete against larger carriers like BT and France Telecom.

EC Competition Commissioner, Karel van Miert, confirmed that the EC is not aiming to set up a regulatory advisory body to police the liberalisation measures planned. He said the EC will set ground rules for the whole EC for application by national members.

C&W in Asian Joint Venture

Cable & Wireless has set up a new joint venture with its 58.4% owned subsidiary, Hong Kong Telecom, with the aim of attacking Asian markets.

The new joint venture will be 51% owned by C&W and 49% by Hong Kong Telecom. It will be headed by Mike Gale, Cable and Wireless's Executive Director, Asia, and CEO of Hong Kong Telecom. The new company will pursue opportunities throughout Asia, from Burma across to, but not including, Japan, said a spokesperson.

C&W already has a number of investments in Japan, as well as in Thailand, the Philippines, and Macau (where it owns 51% of the local telco). The initial capitalisation of the new venture has not been declared.

More to Join European ATM

Another seven European public network operators have joined a project to test ATM transmission. Telefones de Lisboa e Porto, Televerket (Sweden), Telecom Finland, Swiss PTT, Belgacom, Telecom, Telecom Netherlands and Norwegian Telecom signed a Memorandum of Understanding (MoU) to join the project in March.

The original MoU signatories were BT, Deutsche Bundespost Telekom, France Telecom, Stet (Italy), Iritel and Telefonica. The plan is that the 12 operators will all work on a pilot European ATM infrastructure, with each procuring ATM cross-connects conforming to CCITT and ETSI standards. These will initially be connected by each operator with 34Mbps links.

Czechs to Privatise SPT Telecom

Privatisation of the Czech national carrier, SPT Telecom, is planned for this year, probably some time after August/September, according to the Telecommunications Office of the Czech Economics Ministry.

Under the original plan announced in September 1992, the state was to retain a 51% stake in the carrier, while 49% was to be offered to the Czech public. However, due to an anticipated shortfall in the finance needed to rebuild the Czech telecommunications infrastructure, national Economics Minister, Karl Dyba, made the decision to increase SPT Telecom's capital base to allow 27% to be offered to foreign investors via US merchant bank JP Morgan.

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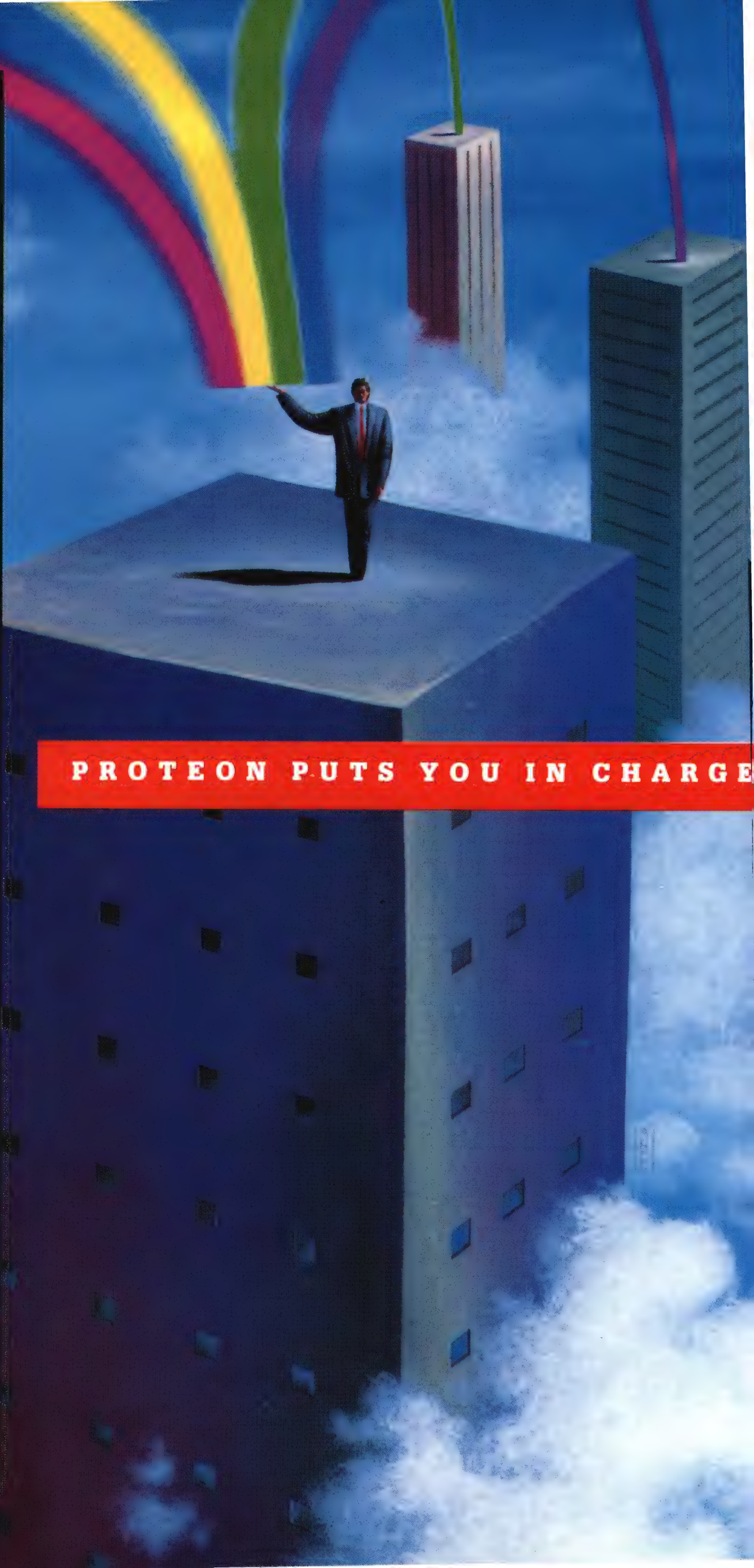
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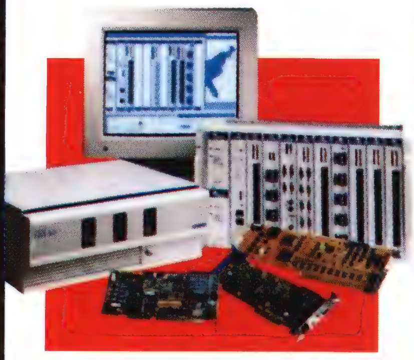

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Telecom's State SPA Strike

Victoria's Vistel is in grave danger, while SA's Information Utility is on shaky ground, following Telecom's latest State Government deals.

For most of the past ten years State Governments have been looking at ways to cut their massive communications costs. Each State has hundreds of different departments, ranging in size from single office operations to statewide bureaucracies employing thousands of people, not to mention schools and hospitals, all being billed separately by Telecom. Not surprisingly, when they look at the cost, complexity and duplication of these facilities they say to themselves that there must be a better and cheaper way.

Long before the duopoly, deregulation and unrestricted resale, the Queensland Government very cheekily tried to bypass Telecom with an Aussat-based system, Q-Net. It did not really succeed, and Q-Net was eventually sold off, although it continues to provide services to the Government. Attempt number two in Queensland appears to have been more successful, so far. Last year Pacific Star won a contract to manage the Queensland Government network.

NSW spent ten years and untold dollars on reports, investigations and tenders. It eventually handed the job to BT, but not before it too had tried to bypass Telecom with a statewide corridor of land under one title surrounding existing State-owned infrastructure. The Federal Government canned the whole thing, and rightly so.

The Northern Territory negotiated a ten year deal with Telecom in 1987 which it claimed would save it $76 million. The WA Government called for proposals for a State network in 1988, but abandoned the project about a year later without having made any decision on the proposals. A year ago it had another crack, announcing a wide-ranging information technology policy.

Tasmania, perhaps wisely, waited until technology and regulation came up with an easy solution, and then went for it: many Government bodies joined up to become a single customer of Telecom's Horizon virtual private network service.

Now the only two States still adopting a DIY approach to their communications are Victoria and South Australia, and in both cases plans seem to be coming unstuck.

Vale Vistel?

Victoria set up Vistel in 1987 to provide communications to government bodies. Vistel owns and maintains PABXes in a number of government departments. Individual departments are under no obligation to use Vistel, it has to compete for business with Telecom and PABX suppliers. Last year it managed some 25,000 PABX extensions and had about 15% of the State Government's telecommunications business.

Vistel also has another very important asset. Shortly after it was set up, the Government entered into an agreement with Telecom under which Telecom installed optical fibre cables along State-owned easements such as railway lines. The State Government made a contribution towards the capital cost of the project. This amount was judged to be equivalent to the cost of setting up a regional network capable of meeting government communications requirements.

Telecom in return granted Vistel the right to use major transmission links within the State. The initial agreement was for ten years and the cost to the State over this period was put at $12 million. The agreement also forestalled any possible future competitor to Telecom, because it gave Telecom the exclusive rights to lay cables on these easements.

Signs that the Government was less than happy with the arrangement appeared last June when news broke that it was negotiating with Telecom to buy Vistel. Victorian Treasurer, Terry Sheehan, wrote to Telecom CEO, Frank Blount, in June, inviting Telecom to submit bids. However, it was not clear where the initiative for the proposal originated. There were rumours that it came from Telecom's State Government account team and not from the higher echelons of Telecom or the Government. The price was believed to have been about $20 million.

The Government was criticised for not putting Vistel onto the open market and there were questions raised about whether Telecom acquiring Vistel would breach Section 50 of the *Trade Practices Act*, which prohibits a company from acquiring the assets of another company if by so doing it would be in a position to dominate the market. In the end, Telecom withdrew its offer.

But with communications in the other two major States already well and truly in the hands of third parties, Telecom was not about to let Victoria slip out of its grasp.

In April, Vistel staff fearful for their jobs, started talking. A plan had been devised under which Telecom would acquire the transmission assets of Vistel only for $10 million,

Preselection

A Very Easy Call For Optus

On May 5, Optus and Telecom, with the assistance of Austel, signed a Heads of Agreement on terms for the preselection ballot. Both agreed to use their best efforts to complete the process and sign schedule 13 of their licence conditions, the legal document which will allow the ballot to proceed, by May 14. The last few weeks of negotiation had been extremely difficult. A major stumbling block had been how customers of Telecom's Easycall service should be treated. Easycall allows customers to have their calls diverted to numbers they program in through their handsets and to program abbreviated dialling via the handsets. The facility is implemented in the local exchange.

Optus insisted that, where a customer preselects Optus, all such calls should also go via its network. Telecom said they should be routed via the Telecom network because it is providing the service. If the customer wished to use Optus for these calls then, Telecom argued, he or she could program in the required four digit access code.

Optus does not at present offer Easycall style services and has announced no plans to install its own local exchanges so is unlikely to be able to offer these in the future.

In the end Optus won. In spite of the fact that Austel guidelines on preselection quite clearly supported the Telecom view. How?

Austel was earlier called in to arbitrate on the question of whether access to Telecom's 0015 international fax service should be preselectable. It ruled against preselection and instructed Telecom to make available a new access code in order for Optus to be able to offer a similar service. In making this decision, Austel published a 27-page document which it intended should provide general guidelines to be used to decide whether any other service should be subject to preselection. These guidelines would clearly exclude Easycall from preselection.

In the determination, Austel suggested that the initial basket of preselectable services should comprise only standard/basic long distance voice services, and codes used to access the individual services 'should be well known and widely recognised.' The services should also 'be used by a substantial proportion of the Australian population.' Austel recommended that only the initial preselection basket be implemented by ballot, the rest should be by canvassing.

Austel also recommended that services to be included in a preselection basket should be of similar type and have similar levels of sophistication. Because Optus does not offer a service akin to Easycall at present, this again would exclude Easycall.

Austel pointed out that neither the *Telecommunications Act 1991* nor the carrier licences provided any guidance to services subject to preselection, so it took as its starting point the objects of the Act, the Second Reading Speech on the bill, the Government's November 1990 policy statement and relevant Ministerial directions, in particular the Ministerial direction of November 27 1990 'Guidelines for Austel's study of arrangements and charges for interconnection and equal access.'

Austel has flagged equal access as the key objective of the Act and concludes that 'equal access is concerned with ensuring that new market entrants have an equal opportunity to compete for customers and market share.' Critically, Austel says 'equal access is not about giving new market entrants an equal share of an existing customer base.'

'Austel considers that the inclusion of services that differ significantly in nature, type or level of sophistication within a single package of preselected services would not promote an actively competitive marketplace, be conducive to competitive behaviour or promote ease and convenience of customer choice. It considers that equal access would not be promoted by customers being automatically allocated to a particular carrier for a particular service as an inevitable consequence of having selected that carrier for an entirely different service.'

Telecom has made an investment in the network facilities which support Easycall over and above that required for the basic network, and would no doubt argue that Optus should not be handed the customers for these services on a plate simply as a consequence of them preselecting Optus for basic long distance and international services. Austel appears to agree. 'If all carriers could access and use infrastructure at the same price and conditions as the carrier that built the infrastructure, it is difficult to see what incentive there would be for any carrier to develop infrastructure in the first place.'

So after all this, how did Optus get Easycall into preselection?

There have been no official statements, but it is widely known that carrier negotiations were suspended late in April pending

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with the PABXes remaining under government ownership and management. Discussions were also held for Telecom to buy the PABXes for $7 million, but these failed.

According to Vistel sources this new plan will result in about 20 of Vistel's 24 staff losing their jobs. They will not be the only losers. In addition to selling off Vistel assets, the Government intends to sign a five year strategic partnership agreement (SPA) with Telecom. Percentage discounts under SPAs rise with the value of total business. So the Government has issued an edict to all departments that they are not to enter into new contracts with Optus, AAP Telecommunications (AAPT) or other service providers.

However, Vistel has a contract with AAPT to carry all its interstate traffic. This is believed to be worth $5 million per year, making Vistel AAPT's largest customer. At the time of writing, the Government had not decided whether to continue this contract.

The decision could also have wider ramifications for State Government users in rural areas. Vistel sources say that Vistel's CBD clients, who make up the bulk of its customers, effectively subsidise services such as videoconferencing to rural areas.

SA's Stalled Utility

South Australia had even more ambitious plans than Victoria. In June 1991, it announced its intention to create an 'Information Utility' in conjunction with two private sector consortia.

Digital Equipment Corporation, Andersen Consulting and OTC (as it then was) were to develop a text, voice and data network and an electronic mail service for State Government bodies. Telecom and IBM were to team up with a joint venture between NTT International and local consulting firm Lane Telecommunications to outsource government telecommunications.

These organisations promised to make considerable investments in the State. Digital was said to be planning a $50 million high performance computing centre.

Six months later the Information Utility's future was not looking quite so rosy. Services had been scheduled to commence at the end of 1991, but the business case was taking longer to establish than anticipated and the consortia members were in disarray. IBM had left, saying the consortia arrangements conflicted with its business plans.

Following the withdrawal of IBM and the merger of Telecom and OTC the two consortia merged, and by May 1992 the Government was within weeks of a decision to approve plans for the new consortium to establish a State-wide network. Speaking at ATUG'92, the Information Utility's Manager, John Shepherd, said feasibility studies had shown that there would be a net benefit to the government, but not a large one.

Curiously, when the project gained Cabinet approval in July, the Government said it was expected to result in savings of $90 million over five years, Hardly a small net benefit. Since then: silence, for almost a year. Then on March 22 this year, the State Cabinet voted to reject the consortium's business plan. This required the consortium partners and the Government to own the network with the Government having only a minority shareholding. The Government decided instead to retain ownership of the receipt of a letter from Communications Minister, David Beddall, giving Austel some 'guidance' on certain aspects of preselection, with particular reference to Easycall.

It is said that the Ministerial intervention followed a visit to him by Optus CEO, Bob Mansfield, on April 22. What is not clear is to what extent, if at all, the Department was involved in the matter. Given the Minister's inexperience with his portfolio, departmental involvement seems highly likely.

What then is the role of Austel, if its position is being challenged not by formal directions from the Minister, as provided for in the Act, but by correspondence?

Interconnect Still Unresolved

The debate on preselection issues may be all but settled, but there is another major hurdle to be overcome before preselection can be implemented. Optus will have to negotiate a new interconnect fee with Telecom. This could result in further delays.

The interconnect fee was set in 1991 at 3.14 cents per end per minute. Of this 0.52 cents covers the use of Telecom's customer access network, and it is this component plus a component for the use of the local exchange network and the local junction network, that will be have to be negotiated before preselection can take effect. The carriers are understood to not have commenced negotiations on May 5, the date the Heads of Agreement on preselection was signed.

Optus is hardly in a good bargaining position, with Telecom being the sole supplier of the local exchange network and the customer access network.

Stuart Corner is the Editor of Exchange.

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network and enter into strategic alliances with the consortium members.

Now, lo and behold the South Australian Government, like others before it, has seen the wisdom of negotiating bulk discounts from Telecom. It too is about to sign a SPA. The Government says it spends about $22 million a year on basic communications services, so will be eligible for a 6.8% discount under the SPA, giving a modest saving of $7.5 million over five years. This is much less than the claimed $90 million to be saved over the same period with the Information Utility — although with basic communications service expenditure of only $22 million per year it is hard to see what other expenditure is being made that would make possible savings anywhere near the $90 million ($18 million per year) claimed.

In spite of all these changes of plans and directions, the State Government maintains that the vision of the Utility is undimmed and that it will be up and running by the end of this year. I wonder.

Stuart Corner is the Editor of Exchange.

Preselection

CWU Blasts Ballot

The Communication Workers' Union last month mounted an eleventh hour campaign to stop the preselection ballot which, it says, could see Telecom shed more than 10,000 jobs. According to CWU Research Officer, Kevin Morgan, the 'best' ballot outcome Telecom can expect is a 20% loss of the $2.8 billion long distance market and a similar share in the $1.4 billion international market.

Morgan's recent policy paper, which was unanimously endorsed by the CWU national executive, argues that in 1997, when Optus is obliged to have 100% service coverage, annual revenue foregone by Telecom from a 20% loss in the long distance STD market could range from $340 million to $620 million (at 1993 prices). Each additional 1% loss of share could see between $17 and $32 million worth of traffic shifted to Optus, depending on its 'quality.' Indeed, given that Dial 1 Access has provided Optus with the market intelligence to target high volume customers, a 20% loss of market volume could flow from losing a much smaller percentage of customers.

The paper claims that Telecom management has argued that 5,000 jobs will be shed for each 10% of market share lost; other Telecom arithmetic suggests that each $1 million loss in revenue represents 20 jobs. 'While such arithmetic may be treated with a degree of scepticism, the simple reality is that once market share loss is confirmed through a ballot, Telecom will be able to firmly indicate what level of downsizing is needed to adjust cost structures to the new environment.'

Morgan's 20% market share loss is based on the experience of AT&T in the US after a series of ballots during 1984-1986. However, AT&T's retention of 80% of the market by the end of 1986 was achieved in a different environment which, he argues, was far more favourable than the one currently facing Telecom for the following reasons:

- Telecom and Optus are the only carriers on the Australian ballot. In the US, some 65 companies listed as interstate carriers in 1984, and this multiple choice created a level of confusion that favoured AT&T;
- Optus is ready to match Telecom's advertising budget. AT&T outspent its competitors by 3:1, increasing its advertising budget by 300% between 1983-1986;
- Preselection in the US ensured that competitors faced a large hike in commercially-based interconnect rates. No interconnect price for Optus has been negotiated at this stage;
- AT&T had reasonable freedom to price competitively. It was not bound by price caps, although a prohibition on deaveraging ultimately limited the discounts it could offer. Telecom is severely limited by overall price caps;
- The US market was broken into discrete segments with structural separation between local and long distance carriers. AT&T was not responsible for funding the Customer Access Network (CAN) so loss of market share had no implications for the cost or quality of local service. Telecom must continue to fund the CAN deficit (an estimated $800 million per annum) from STD/IDD earnings;
- In Australia, balloting will apply to at least 90% of customer lines in each Inter Carrier Charging Area (which corresponds to a closed numbering area). In the US, a far lower percentage was subject to ballots.

The policy paper concludes that there is no overwhelming case to proceed with balloting as opposed to normal marketing techniques such as direct mail and advertising, and questions Austel's power to direct the carriers to implement the Government's preselection policy using balloting.

Liz Fell

Indicative Telecom STD Revenue Losses at 80% Market Share

YEAR ENDING	OPTUS COVERAGE (ORIGINATING TRAFFIC)	LOSS PER ANNUM (IN 1993 DOLLARS)	
		Scenario A	**Scenario B**
1993†	45%	$76 Million	$140 Million
1994	68%	$230 Million	$421 Million
1995	72%	$245 Million	$452 Million
1996	80%	$272 Million	$496 Million
1997	100%	$340 Million	$620 Million

† Revenue loss in the first six months if the first ballots are held in July 1993

Scenario A based on loss of a mix of STD traffic across charging and time bands. *Scenario B* based on loss of capital city daytime STD traffic which represents 30% of overall STD volume but 50% of total STD earnings.

Assumptions

1. Each Inter Carrier Charging Area (ICCA) balloted will generate traffic in proportion to the number of lines (i.e. Sydney, Melbourne, Canberra, with 45% of lines, generate 45% of STD traffic only).
2. Subsidised interconnect rates will end with preselection and Telecom negotiates an interconnect fee equal to the amount paid by service providers such as AAPT (i.e. around 5.5 cents per minute). Interconnect is paid at both ends.
3. In line with US experience and Australian trends, no real growth in revenues (i.e. growth in long distance volume will be balanced by real falls in STD tariffs).

Source: Communications' Workers Union

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GSM

You Never Know Who's Listening

The country that gave us the Camilla tapes and the Squidgy affair, is quite rightly rather sensitive about security in its mobile phone system. The funny thing is that the UK appears to be more worried about having too much security, rather than too little.

The A5 encryption which is built in to GSM mobile telephony has been a burning issue in Europe for some time, but it has only now surfaced, probably because handsets carrying the encrypting chip are beginning to come off the production line. Until now the threat of 'ultra-security' had been only an academic and theoretical discussion.

Actually, A5 is only one of a half-dozen encryption systems built-in to GSM, but to the spooks of MI6 and the British Department of Trade and Industry (DTI), it is the most important. They aren't alone — apparently a number of the security agencies in Europe were concerned, but it was the DTI which took the public action.

According to Kari Marttinen, Chairman of the GSM MoU group, "these algorithms, as well as several functions which are characteristic of the GSM system, have been submitted to export licence regimes [at a time] when there is only a minor chance of making deep-going changes to the system's principles and specifications. There must be a way of solving these problems, or otherwise one has to accept the fact that GSM possibly cannot respond to the rather optimistic expectations on which the huge development investments have been based," he said — and then added ominously: "The first problems are concerned with export licences for the security algorithm A5, *but others are to be expected*."

The main problem is the CEPT-invented A5 algorithm which is used to encrypt communications between the mobile and the network for sensitive information such as the user-identification signalling data and user-speech. But in GSM, the range of security and authentication measures taken to secure the system is mind-boggling.

It you look into GSM you'll also find A3 authentication algorithms which generate the key Ki; A8 which produces the Cipher Key called Kc; then there's the IMSI (International Mobile Subscriber Identity) and the TMSI (Temporary Mobile Subscriber Identity) used to conceal the mobile's location, and the SIM's (SmartCard Identity Module's) PIN and its PUC (Personal Unblocking Code) which you use if you forget your PIN. And these are the ones we know about!

Don't forget that the digital system and time-division techniques already have a very high intrinsic security. And any bugger will first need to crack the code which handles the requests for connection to find a specific caller, and then be able to handle transmissions hopping around the spectrum on a pattern only known to the base and the mobile itself. Quite a problem, I'd have thought!

Fortunately, to the DTI nothing speaks as loud as exports, so when it and the European security and law-enforcement services were ganged up on by the combined European manufacturers, they backed down and allowed Australia and a few other favoured vassal states of the ex-colonial powers to have the technology — on a temporary basis. Hong Kong was one of the favoured few, but only on condition that the A5 chip didn't cross the borders into China!

Not to be outdone, Australia's security people then implemented their own black-ban on A5. There's considerable divergence of opinion here as to what happened — one side says the spooks forgot to tell anyone until an hour or so before Telecom was due to launch, and the other side says that the non-use of A5 was part of the early licencing agreement — it's just that no one wanted to write it down in evidence.

I must say that my original reaction was pro-Telecom. I couldn't see why security and law-enforcement organisations felt it necessary to be able to crack the code and listen in on other people's conversations.

But I've changed my mind. There are real dangers in having untraceable mobile telephones — and with GSM you can't even find their approximate location. There are all sorts of problems with this scenario, from those of the heavy-breathers to Mafia kidnappers.

Really, when you think about it, the best form of telephone security is to not make important calls over a mobile phone, with or without encryption. Do what every TV scriptwriter has his secret agents do, and walk outside to a phone-box. Don't forget that only part of the voice circuit is over the air-waves, and it's doubtful that Di and Chuck were caught by scanners anyway.

Both in Europe and Australia, it now seems that a deal has been cut to change over to the new not-so-unbreakable algorithm called A5X being developed. The system already allows for unencrypted transmissions for use in the ex-Communist countries, and those of the West will change over to A5X through base-station software changes.

The new mobiles supporting all three possibilities (A5, A5X and unencrypted) will have a transistor count increased from 2-3,000 (A5 only) to 4-5,000 (for A5 and A5X), but this multiple system isn't due to happen until Phase 2 in mid-1995. However, no one has been able to tell me what they intend to do about current handsets; it's doubtful they will retro-fit them with A5X, so they may just switch them to unencrypted. So much for GSM's intrinsic security!

Stewart Fist

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New Zealand

BellSouth Proposes Regulatory Forum

New GSM mobiles operator, BellSouth, is already making an impact on the market — though in an unexpected way. In early April the company joined New Zealand's regulatory debate in a dramatic way, proposing an independent industry forum to resolve competitive issues. If the others in the industry agree to the plan — a very big if — BellSouth's forum could break the regulatory gridlock currently stifling telecommunications competition.

The forum is the brain-child of BellSouth New Zealand Managing Director, Keith Davis. Mr Davis originally wrote about it in a magazine feature and subsequently talked about it in a newspaper interview. Since then, his idea has snowballed, with other carriers and potential market entrants pressing BellSouth for details.

While there is no doubt the idea is genuine and deserves to be taken at face value, it also has all the hallmarks of a clever public relations campaign. The issue managed to keep BellSouth on the front page of New Zealand's trade press during recent weeks and may continue to do so.

By late April, Mr Davis' ideas had formed into a rounded proposal. Carriers such as BellSouth, TCNZ and Clear Communications would provide the funding, each paying a joining fee of, say, $NZ100,000 followed by a share of the running costs. In addition, TUANZ would be represented.

The forum would be permanent, with a small full-time staff and a director. The body would have access to costing and market information. Above all else, it would have the teeth needed to impose binding arbitration during disputes. After arbitration, decisions would be disclosed to forum members.

Mr Davis seeks to fill the vacuum left by New Zealand's government which steadfastly refuses to play a regulatory role. He points out that in the five years since New Zealand deregulated, many opportunities were missed because of litigation.

But overall, his plan has not been enthusiastically received. A canvas of industry executives showed views ranging from outright cynicism to guarded interest. Everyone believes the forum plan is a genuine attempt to break the regulatory gridlock. Most welcomed the injection of fresh-thinking.

However, everyone spoken to mentioned a number of specific misgivings. Perhaps the major fear is that the forum could become a de jure regulatory body. Users fear a body designed by and for the industry could become at best a barrier to new entrants and at worst an industry cartel. The $NZ100,000 entry fee would automatically exclude some of the small local or niche companies now attempting to enter the market.

A third, and more tangible, misgiving concerns the legality of forum decisions. Mr Davis wants the forum to not be bound by any previous legal precedent when making decisions. This potentially exposes any important forum arbitration to appeal through the courts. In effect, even if all participants agreed before joining the forum that its rulings should be final, aggrieved companies can still appeal.

Clearly all these objections can be overcome. At this stage the proposal is just that and is open to negotiation. Some consensus is forming that telecommunications companies would like to resolve disputes without protracted and expensive litigation. However, it appears Mr Davis may have his work cut out selling his forum idea to his competitors in its current form.

Bill Bennett

Marketing

Getting it Down to a 'T'

What's in a name? Plenty, it seems, if the mega-bucks behind AOTC's switch to Telstra Corporation are any indication. The reasons for the identity revamp are multiple and complex, even though for domestic customers, the whole exercise means little more than getting used to a blue, white and yellow 'T,' in place of the ubiquitous 'orange pumpkin' so familiar on everything from bills to public phones and TV commercials since 1975. In terms of the impact on the Australian market, it could be said that the millions spent selecting and designing an entirely new name and corporate identity really comes down to re-designing the letter 'T.'

While the multi-functional icon stands for 'Telstra' in the international arena, it still means 'Telecom Australia' domestically, though Telstra may be introduced within Australia if this is considered either necessary or desirable at any time within the next few years. Such a decision would depend on changes to the competitive environment in which more foreign operators were allowed into Australia; directions from Austel; or as a consequence of this year's preselection ballot. "A lot depends on how quickly preselection happens, what the issues are, and whether ultimately one name is called for by Austel. Whatever happens, we are now set up to change the name if necessary," says Telstra's Group Manager, Corporate Identity, Candice Gartner.

So, as the preselection ballot looms, it is Telecom Australia, with its brand new 'T,' rather than Telstra, that will be promoted in the media advertising battle for the hearts and minds of subscribers. It seems only logical that Telecom would not want to disturb a 90% recognition factor for its name, and arguably the best known logo in the country, just before such a crucial vote. Telecom believes the new 'T' will help dispel any lingering memories of a somewhat remote and uncaring monopoly and reinforce its new image as a dynamic and user-friendly organisation. The transition to the new logo should be complete by early next year.

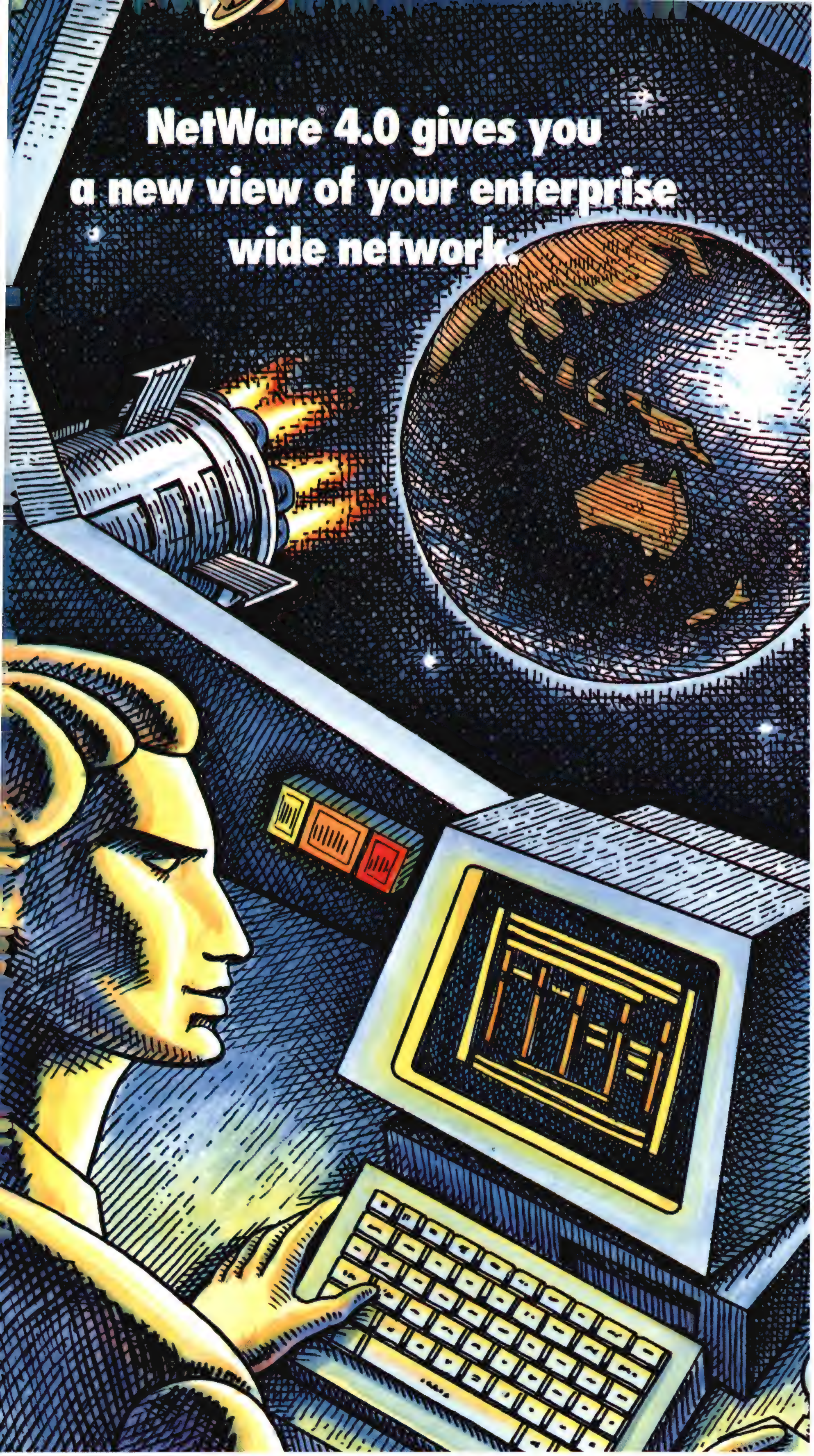
At a raw commercial level, the single most compelling reason for the change is that 'Telecom,' a generic term, cannot be universally registered, and therefore possessed, unchallenged, as an asset. Then there is the fact that as Australia's former telecommunications monopolist extends its interests overseas, foreign companies that also employ the 'T' word in their names may very well be extending their global operations into this country; it could all become rather confusing, not to mention costly if it ever came to a legal tussle.

Third mobiles licensee, Arena GSM, now called Vodafone Australasia, had similar reasons for its name change earlier this year. The word 'Arena' was used by too many other companies, some of them in the communications industry, and would have been difficult to defend, says Australian Director of Vodafone, Philip Cornish.

More Foreign Influence

The former AOTC spared little expense in reinventing its image, hiring the London office of New York-based corporate identity specialists, Siegal & Gale, whose client list includes such giants as BP and government utilities and agencies around the world. The decision to use an overseas rather than an Australian consultant, derived from Telstra's stronger international focus since the arrival of Optus, and the corporation's desire to exploit the latest world trends in corporate profile shaping.

Candice Gartner says the original computer-generated list of possible names ran to several thousand. This was whittled down to a shortlist of alternatives, incorporating the prefix or suffix 'tel' and 'Australia.' International corporate searches and due diligence continued the culling process and Telstra emerged to fulfill the essential criteria of being a permutation of Telecom Australia that was not only pronounceable and pleasing, but just as importantly, available, defendable and registerable internationally. A comprehensive brief then went to the Melbourne-based Flett, Henderson and Arnold (FHA) agency which deployed a team of about 35 that delivered over 1,000 design ideas before the new symbol was approved by the AOTC Board.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FHA expects the design to do 'extremely well' in international corporate identity competitions in Japan, the US and Europe and has plans to enter it in the Australian Graphic Designers' Association's (AGDA) biennial awards in Adelaide next year.

While some advertising and marketing industry wags have suggested that Telstra is a little too close to Telstar (with the corollary 'Have you driven a Telecom lately?'), the new symbol has been met with generally favourable reactions from Telstra staff and the media. "Staff are relieved that there is now a single corporate identity, whether they are working in Australia or overseas," Gartner says.

According to John Nowland, National President of the AGDA, the Telstra name and the 'T' are visually strong and reflect the rapid globalisation of the telecommunications industry through the use of satellites. "Its success will depend on where it is applied, the scale of the logo in various forms and the repetition," Nowland says. "I think Telecom may have been motivated partly by the strength of the Optus logo, which has a lot of movement. A really good corporate logo should contain many signals. You should be able to read many different things into it."

To avoid confusion overseas, the words 'OTC Australia' will be retained in smaller letters beneath the Telstra name for at least six months and possibly until the end of the year. In the meantime, all OTC signs are being removed and replaced at Telstra offices in 22 countries.

Telstra's Business Marketing Manager for Offshore Business, Jane Coucher, sees the new logo as giving Telstra "one look, one voice." She says some of the more lyrical descriptions refer to "the blue of the ocean, the white of the clouds and the orange of Australia's burnt centre."

"The old logo was beginning to look messy and tired. For example, the orange often faded to yellow, depending on the product or the medium that carried it."

Coucher confirmed that at least $2 million will be spent on advertising the new Telstra logo overseas, including changing the old OTC Australia advertisements being run on the ABC's Australia Television International (ATVI) satellite broadcasts into Asia.

While retaining the catchcry 'Your Ideal Partner,' the new ATVI advertisements and advertorials feature two kangaroos bounding along together and then merging into one; at the same time, the OTC Australia logo changes into the new Telstra symbol.

Bernard Levy

Multimedia

New Multimedia Alliances Mooted

Just a couple of years ago US telcos and cable TV companies were arch enemies, but now it seems, those days are slipping by. Alliances between telcos, and computer and cable TV companies are beginning to appear as a realisation is forming that sharing technology is the way to progress. And they're all after one thing — a piece of the pie of the next big boom in technology, which basically turns the TV set into a medium for home-shopping, movies-on-demand, teleconferencing, databases, computer games and who-knows-what-else.

Computer giants such as IBM, Microsoft and Apple are all lusting after the consumer multimedia market, each talking separately with the world's biggest cable television company to set up partnerships.

That company, Tele-Communications Inc. (TCI) of Denver, Colorado confirmed it was discussing business partnerships with each of the computer companies. "Everyone is talking to everyone else," confirmed Bob Thomson, TCI Senior Vice President.

Thomson refers to a slew of hushed talks between US computer, cable TV and telecoms companies currently underway: Time Warner is huddled with Silicon Graphics and with AT&T, while Apple Computer contemplates a bid for NBC.

Joint ventures between technology firms and the cable and TV companies will play a major role in meshing necessary technology and jump-starting the new industry. Computer makers in particular see such technology as the most promising new growth area during the 1990s. Cable firms are beginning to convert systems to fibre optics to radically increase the power of the traditional coaxial cables that already reach into nearly 60 million American homes.

It was TCI which first announced aggressive plans in April to dish out $US2 billion by 1996 to build fibre optic-based cable TV systems to 90% of the neighbourhoods in which its 10 million subscribers live. Time Warner, which owns the second-largest cable outfit, says it will do the same for its 7 million viewers by 1999.

The plan by TCI to lay fibre-optic cable within more than 400 communities across the US by 1996 marked a keen acceleration in the race between cable and telephone companies to bring the consumer services to households, and has helped to convince Wall Street that the new technology will indeed unfold as predicted.

It was also what spurred on partnership talks between the cable companies and computer vendors.

IBM is also staying tight-lipped on specific discussions but recently set up a separate unit with a strategy to 'quickly commercialise leading-edge multimedia solutions,' and said it will participate in joint ventures to accomplish that goal.

"We're already up to a couple things," confided IBM spokesman David Harrah. "We're currently conducting studies with Blockbuster Video (a large US video retail outlet) on implementing high speed video, which may turn into something."

Jumping into this industry shift early, games specialist Sega America has already inked a first deal with TCI along with Time Warner to allow kids in several thousand US homes this year to pull games directly onto the TV screen with the push of a button.

But it is not just software deals that are underway. Delivering the 'communicopia' into the home will require hardware that combines the functions of a standard cable-box with those of a PC. An alliance is expected soon between Microsoft, Intel and General Instruments to deliver such a device.

Yet another team jockeying for position in the field of interactive TV is the alliance between Silicon Valley start-up 3DO with Time Warner, AT&T, Electronic Arts, and Matsushita Electric Industries.

But Who Wants it?

But whether the consumer even wants the kinds of services that can be delivered has yet to be seen. And whether the consumer wants to pay for the services is another burning question.

To try to answer this question before making massive investments, cable companies are planning large-scale testing. Viacom, one of the largest cable operators in the US, is putting finishing touches on a fibre optic cable in Castro Valley, California. By year-end, almost all of its 12,500 customers in the designated test site will have a new converter box on top of their television sets. The box could ultimately become the gateway for everything from instantly available first-run movies to video games.

The market's potential is vague in dollar terms, but most observers agree it is huge. Analysts admit no one knows the numbers exactly, but current US estimates range from $US4 billion up to $US14 billion by 1995. Wertheim Schroder analyst, David Londoner, was quoted as likening the situation to the initial rise of the railroads, utilities or highway systems.

Others maintain some scepticism, however, and say if the new industry does not 'add value' versus simply competing with video stores, it won't make it.

"The question is, do these partnerships want to move beyond videos," said Tom Adams, a cable TV industry analyst with the market research firm Paul Kagan Associates. "TCI does not plan to rely totally on video business, which is a good thing . . . because the real potential lies in offering services not invented yet."

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DEC Plots a Course for Network Integration

A revamped approach to networking is a key part of DEC's plan to recover lost momentum.

Fate has not been very kind to Digital Equipment Corporation these past few years. The minicomputer maker soared through most of the 1980s, only to hit some nasty air pockets that have left the company slightly shaken and a little off course. A series of miscalculations — most notably DEC's failure to understand the scope of the PC revolution and the decision to pin its networking hopes on OSI — triggered a bailout that sent many senior managers, including founder Ken Olsen, floating down to earth under golden parachutes.

For those now behind the controls at DEC headquarters, the immediate tasks are to regain equilibrium and steer the company back on course. A big part of the recovery plan hinges on DEC's ability to establish a more formidable presence in the networking market. Although DEC helped create many of the core LAN and internetworking technologies now in use, in recent years it has lost its pioneer's advantage to specialists like Novell and Cisco Systems.

DEC is counting on using its big-picture expertise to bring a systems approach to solving the huge network management problems created by growing multiprotocol internets. Two products that are key to this approach are the DEC-NIS (DEC Network Integrated Services) router and DEC's implementation of the OSI integrated intermediate system-to-intermediate system (integrated IS-IS) router-to-router software.

DEC is touting its router and software combo as a complete solution to managing multiprotocol internets. In its version of integrated IS-IS, DEC has extended the OSI protocol to include not only the OSI connectionless network protocol (CLNP) and TCP/IP but also DECnet Phase IV. For PC and LAN integration, DEC is in the process of expanding the scope of Pathworks, its flagship multiprotocol software product line, by offering new network operating system integration features to manage Novell NetWare and Microsoft LAN Manager networks.

DEC's internetworking plan falls under the Advantage Networks umbrella, a program that brings together TCP/IP, OSI, and DECnet Phase IV, DEC's proprietary networking protocol. Eventually, Advantage Networks will offer a complete blueprint for connecting PCs, LANs, and existing network architectures, such as IBM's SNA. Integrated network management will be part of the Advantage Networks blueprint.

An Advantageous Approach

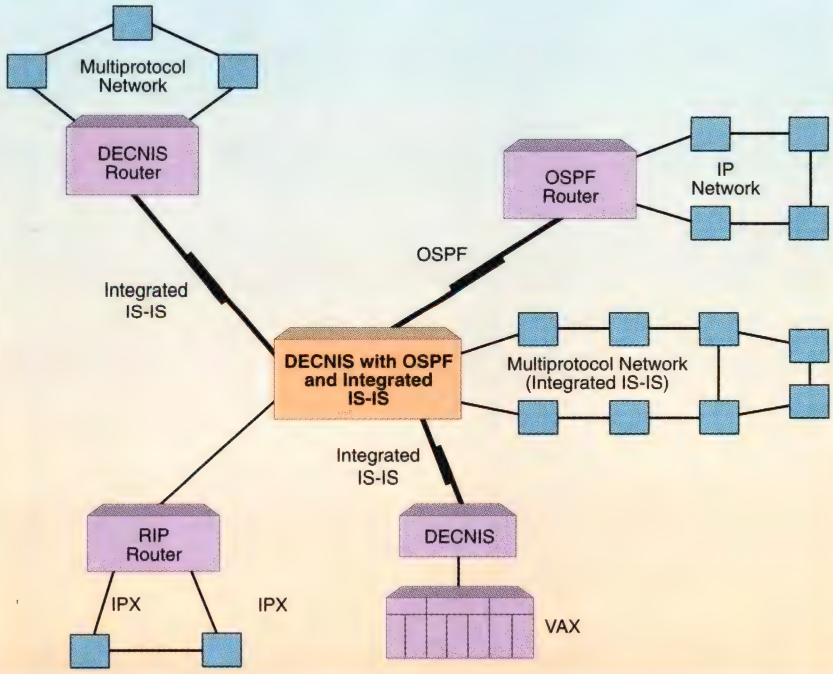
Under the Advantage Networks approach, protocol suites share physical and data link control layers but use their own upper layers. This strategy, referred to as the tower approach, allows applications to interact using either DECnet Phase IV, TCP/IP or OSI. For example, file transfers under Advantage Networks can be performed using the Data Access Protocol (DEC's file transfer protocol), OSI's FTAM (file transfer, access, and management), or TCP/IP's FTP (file transfer protocol).

Up to now, Advantage Networks hasn't made much headway among users. One reason is that software for a large part of DEC's customer base hasn't been available. Advantage Networks for Ultrix, DEC's version of the Unix operating system, was released in 1991, but a version for its flagship operating system, VMS, only started to ship last November. This software, DECnet/OSI for VMS Version 5.5, lets computers running the VMS operating system use OSI networking protocols to exchange information between OSI systems and DECnet to communicate with other DECnet nodes.

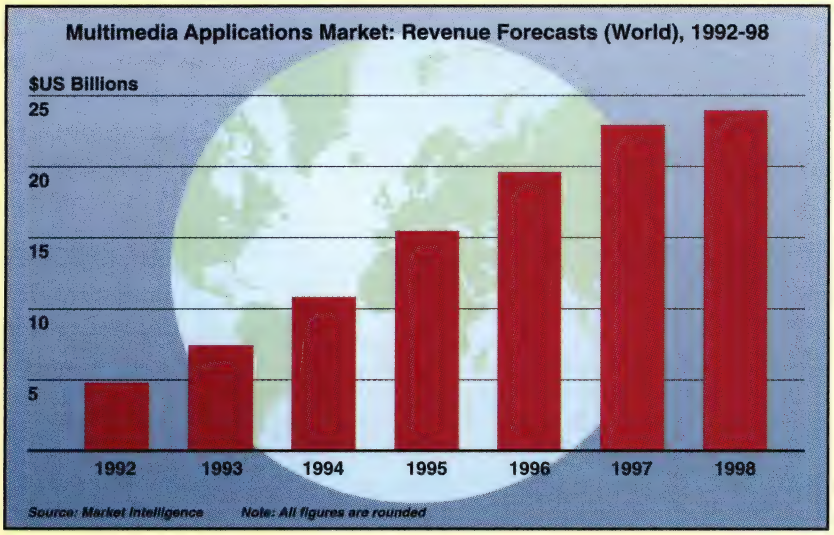
To bolster its Advantage Networks program, last year DEC brought out a number of new products and enhanced some existing ones. In the internetworking area, the centre of attention was DEC's high end multiprotocol router line, the DECNIS 500 and 600. Last October, DEC released DECNIS Version 2, an upgrade of its routing software, plugging several gaping holes in the process. The new software adds several

Figure 1: DEC's View of Network Integration

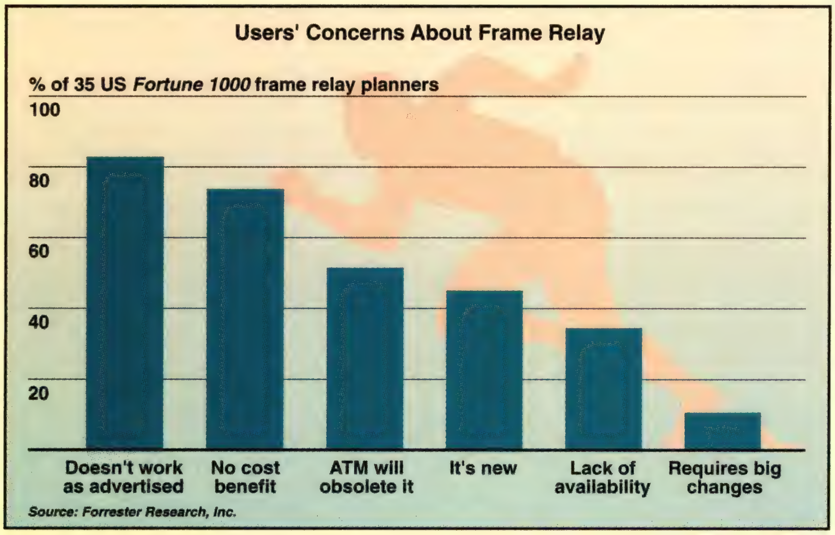
Under DEC's network integration plan, OSI's integrated IS-IS is used in a backbone network to route different protocols. In parts of an internetwork where only one protocol is running, network managers can create subnets using specific router-to-router protocols such as OSPF and RIP.



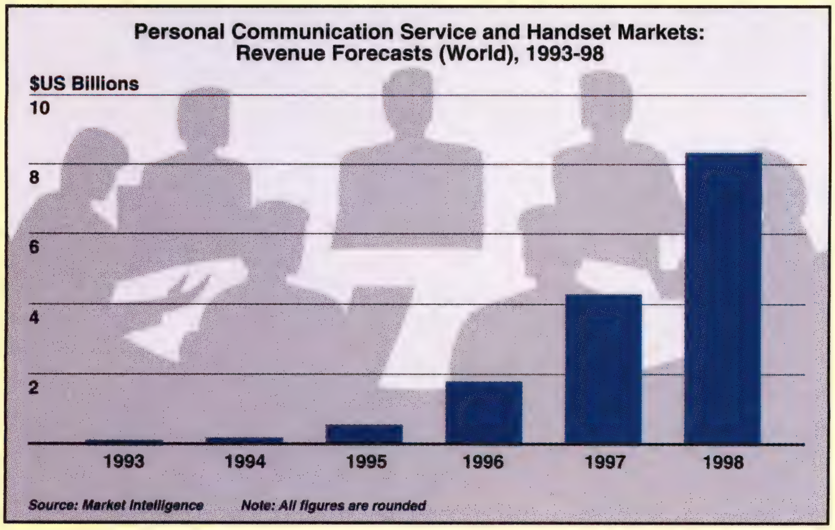
Market Watch


Multimedia Applications Market: Revenue Forecasts (World), 1992-98

Source: Market Intelligence Note: All figures are rounded


Users' Concerns About Frame Relay

Source: Forrester Research, Inc.


Personal Communication Service and Handset Markets: Revenue Forecasts (World), 1993-98

Source: Market Intelligence Note: All figures are rounded

key protocols to DEC's support arsenal: OSPF, the link-state router-to-router protocol used in TCP/IP networks; the industry-standard point-to-point protocol (PPP) to ensure interoperability with routers from other vendors; and two widely used proprietary protocols, Novell NetWare IPX and AppleTalk Phase II.

Obviously, DECNIS isn't the first router to handle all these protocols, but DEC contends that this support, coupled with some high-powered router features, makes its box a potential high flier. Among these advanced features is a custom-designed chip that accelerates the process of handling network addresses. The address recognition engine, as DEC calls it, determines which port and interface card a packet gets sent to. DEC built this engine with OSI's long, variable-length addresses in mind.

DEC claims that the custom chip enables DECNIS to handle OSI routing up to 10 times faster than conventional routers. The vendor adds that this advantage eventually will carry over to handle the more complex IP addresses that will be used once the Internet Engineering Task Force (IETF) formalises a new IP addressing scheme.

A second key advantage that DEC claims for its router is greater network stability because of DECNIS's ability to prioritise the network control packets used to exchange router updates. Routers that fail to process network control packets run the risk of misunderstanding the network topology. If a conventional router gets overloaded, it starts dropping packets; without packet prioritisation, a network control packet can be among those dropped. If the router doesn't read the network control packet, it may determine that the neighbouring router is down. The router then will recalculate routing paths to bypass this 'failed' router. The next time the router receives a network control packet from the 'failed' router, routing paths must be recalculated. DEC avoids this problem by ensuring network control packets get through by giving them priority over data packets.

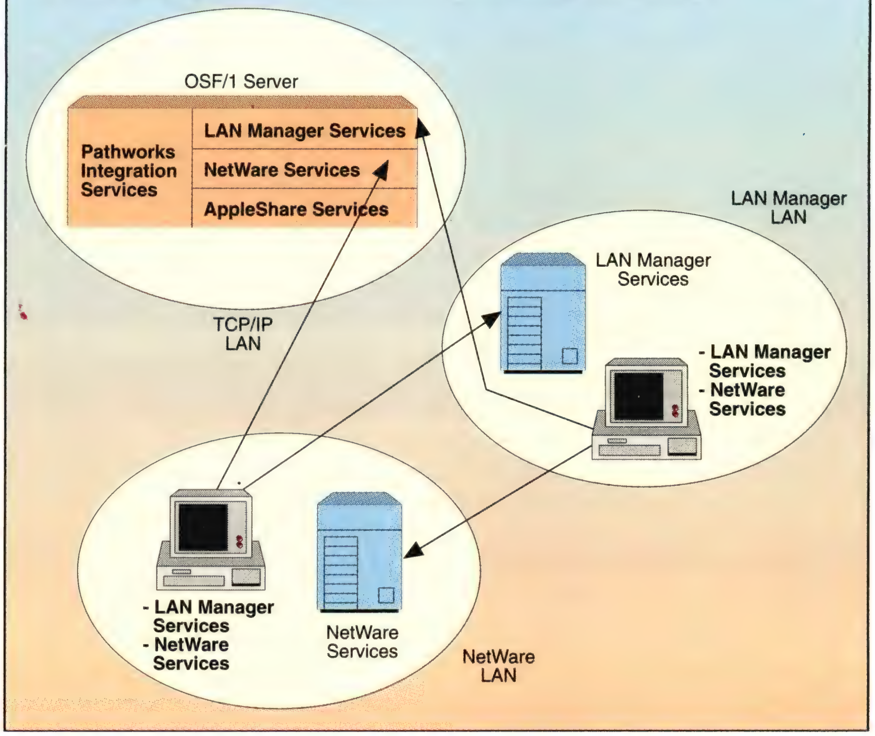
Despite all the advantages incorporated into the latest version of DECNIS software, DEC's product still has one glaring weakness: its inability to handle conventional IBM traffic. Nearly all vendors of multiprotocol routers have been scrambling to include SNA and NetBIOS traffic in their product profiles. DEC, meanwhile, stayed with its strategy of connecting to IBM environments via gateways. The vendor apparently recognises the gateway disadvantage and will announce an SNA router strategy this year.

Integrated IS-IS Advantages

Although DEC has taken some hits for basing its earlier networking strategy on OSI, one OSI investment that is starting to pay off is its commitment to integrated IS-IS as a router-to-router protocol. Integrated IS-IS is

Figure 2: Bringing Network Operating Systems Together

Pathworks will enable client stations on one type of network operating system to access services available on another operating system. In the future, users will be able to manage the mixed operating system environment from one net management package.



based on the OSI IS-IS routing protocol standard, which supports only OSI's CLNP. DEC's implementation of integrated IS-IS extends support to TCP/IP and DECnet Phase IV. (DEC has made the specifications for supporting DECnet Phase IV available to all comers). To make its software more enticing, DEC is working with Novell and Apple Computer to extend integrated IS-IS support to IPX and AppleTalk protocols.

What makes integrated IS-IS so important is that it can handle multiple router protocols, thus simplifying the management of ever-expanding internets. Today's multiprotocol networks often use two or more router-to-router protocols. For instance, a company might have a network with departmental LANs running NetWare and LAN Manager and an internetwork based on TCP/IP (see Figure 1 on page 23). A network manager could choose OSPF as the router-to-router protocol for the IP portion of the network and the routing information protocol (RIP) for the IPX portion.

In this scenario, each protocol is associated with a different network topology and requires its own router tables. Without integrated IS-IS, the network manager would need to manage, in essence, two networks — an IP network and an IPX network. Such networking environments are commonly referred to as suffering from the ships-in-the-night syndrome, since the protocols pass each other on the internetwork without knowing of each other's presence.

The ships-in-the-night approach has some advantages. For instance, besides being able to use more efficient router-to-router algorithms for some protocols, the network associated with each protocol can be optimally tuned for better performance. But there are drawbacks as well. For instance, when the network configuration changes — if a link between two routers gets dropped, for example — a notification of the change must be propagated through the network for each protocol supported. With integrated IS-IS, the notification is conveyed only once, reducing the amount of router update traffic on the network.

Integrated IS-IS also provides a means for simpler network management. With ships-in-the-night networks, each protocol requires a separate network management system. Integrated IS-IS provides one management view for the entire internet.

Under DEC's current routing scheme, IPX and AppleTalk traffic is encapsulated in IP packets for routing over integrated IS-IS. DEC says it will add full protocol support for IPX and AppleTalk, although it has announced no timetable for doing so.

DEC's Extended NOS

Just as DEC is touting DECNIS router as a key tool for multiprotocol internetwork integration, it's trying to position Pathworks as a primary means to integrate multiple network operating systems throughout the enterprise. DEC has come up with a name for this strategy: information integration.

Information integration is aimed at departmental integration of such applications as messaging or document management systems. DEC's goal for information integration is to serve as a bridging between the large enterprise and the small workgroup.

The existence of different network operating systems has created critical management problems that get even bigger as internetworks grow. For example, each operating system typically has its own network management system, directory services, and file and print services. In a typical internetwork setup, a user on a NetWare LAN may need access to data on a Microsoft LAN Manager file server. Providing this access usually is a straightforward process, but managing such a network is complicated. A network manager could set user access rights for every service on the network, but that would require administering each operating system separately.

To circumvent these management problems, DEC is developing for Pathworks what the vendor calls an Extended NOS, a kind of master network operating system under which existing LAN operating systems run. Rather than duplicate the full features of a network operating system, such as printer and file sharing services, DEC's multiprotocol Pathworks software extends those existing services. For example, with Pathworks a user on a NetWare LAN can connect to a Unix host and access files (see Figure 2). Under existing network schemes, if the user wants to print the file, the document usually is sent to the printer attached to the Unix host. But that printer may be in another building, or it may be a high speed printer offering poor resolution.

Using the print services of DEC's Extended NOS, the user will be able to print that file on one of the printers on the NetWare LAN. Pathworks, like other multiprotocol software, provides the means to connect to the Unix host from a NetWare LAN, to access the file, and to get it back to the Novell network. Once there, the printer services of NetWare are used to direct the document to the user's printer of choice and to get a hard copy of the information that was on the Unix host.

In developing the Extended NOS, DEC will tap alliances it has developed with vendors of PC network operating systems. For several years, it has worked with Microsoft to enable Pathworks to support the file and print protocols of Microsoft's LAN Manager. This alliance will yield similar support for Microsoft's new Windows NT product. DEC also has forged ties with Novell to develop a version of Pathworks that will incorporate NetWare file and print services. A tightly integrated DECnet and NetWare system could provide DOS clients with access to NetWare's file and print services and to such DECnet and TCP/IP services as e-mail.

In the Works

Besides shoring up relationships with the leading LAN operating system vendors, DEC says it will announce several more Pathworks improvements this year. These include multivendor management of network operating systems, advanced graphical user interfaces for accessing and managing networked services, integrated server technology, and enhanced information and application integration.

Multivendor NOS management will reduce the time and cost associated with network management as well as provide improved asset management over existing Pathworks products. The next generation of Pathworks system management will provide a way to manage networked systems directly from a remote PC. This will include the ability to perform system configuration management from a remote site.

DEC is developing for Pathworks a new graphical user interface to work with Microsoft Windows PCs and the Apple Macintosh. This interface will give users easier access to network services and will make it easier for network managers to install software and configure clients and servers.

Today, Pathworks offers three separate server environments (NetWare, LAN Manager, and Appleshare) that can all run on the same platform at the same time. However, the three must be managed as separate servers. DEC plans to upgrade Pathworks to create a single, integrated server environment with common management for the three NOSs. Under this approach, one device will be able to act as a server for different network operating systems. This integrated server approach will allow users to have read and write access to files regardless of whether the client is using Appleshare, LAN Manager, or NetWare for its file service protocol.

In the area of operating system integration, DEC says it is developing a new set of Pathworks tools that will offer simplified LAN administration and security management that spans multiple operating systems.

The Prognosis

DEC has plugged several large holes in its internetworking product line during the last six months, and seems intent on developing products to build multivendor, multiprotocol networks. In most areas, such as high performance routing, the vendor simply is catching up to the rest of the field. In others, such as support for IBM traffic, it still has a long way to go. But in a few areas, such as OSI, PC connectivity, and integrated IS-IS support, DEC is offering innovative approaches to networking problems.

Some of DEC's largest users have already committed to Advantage Networks. But industry observers wonder if DEC's strategy will sway potential customers that are not long-time users of DEC gear. The reason for the scepticism is that many still see OSI as the main attraction for migrating to Advantage Networks. And although OSI is gathering supporters around the world, its user base in the US is still very small.

Salvatore Salamone

Asynchronous Transfer Mode

ATM's Unfinished Business

It's easy to see why vendors and industry analysts are so fond of declaring 'revolutions,' and why the technology press is so happy to go along for the ride (see 'Get Ready For the ATM Revolution,' *Australian Communications*, May 1993). There's no doubt about it, ATM (asynchronous transfer mode) is a good way to get more capacity on overburdened internetworks. And that throughput is going to be needed when multimedia and distributed computing makes it big (assuming, or course, that anyone can afford to put distributed applications over the wide area).

But simply slicing and dicing data, voice and video packets into fixed-length cells isn't going to eliminate incompatible workstations and applications or make networks any easier to build. Nor will ATM capture the enterprise end-to-end overnight (as some of the more ardent revolutionaries seem to suggest). The technology is just starting to appear at the campus level, and it will take some time for it to move down onto workstations and out into the wide area. For one thing, ATM's 53-byte cells are not particularly suited to data transmission at low speeds. So until high speed links in the order of US T3 (45Mbps) lines become building blocks for the enterprise, don't look for ATM over WANs.

For another, problems with the suite of standards that define ATM must be resolved before the technology is ready for the wide area. Viable flow control and congestion management schemes need to be put in place. Similarly, ATM's lack of support for switched virtual circuits will slow its acceptance on the desktop. And a way for ATM to communicate with existing applications is a must before the revolution transforms internetworking for all time.

ATM is the handiwork of various international standards bodies, spearheaded now by the ATM Forum, a consortium of carriers, network equipment vendors, and computer makers (see 'The ATM Circus Gets a Ringmaster,' *Australian Communications*, May 1993). Since the spec is still in flux, it's not yet possible to build ATM networks that extend from the desktop to the wide area. Thus, ATM will first be seen on campus networks, linking the bridges, routers, and hubs that tie departmental LANs together. It should make significant inroads onto LANs and WANs by 1995 or 1996.

ATM is probably best known for the fact that it calls for all information to be transmitted in uniform cells (5-byte header, 48-byte payload). But the technology is far more than just a slice and dice scheme that pushes the speed of networks to new levels. ATM is actually a four-layer model that defines how different types of traffic can be mixed on the same switched network.

At the top of the ATM model, the user layer establishes the link between whatever device is generating traffic (router, hub or even an ATM workstation) and the adaptation layer, which takes care of formatting traffic into cells (see Figure 1 on page 28). The adaptation layer actually comprises two sublayers — convergence, and segmentation and reassembly. The first combines different types of data into a single stream and makes sure that each type receives the level of service it requires. (Voice, for instance, is very sensitive to delays on a network and needs a guaranteed amount of constant bandwidth). The segmentation and reassembly sublayer (as its name suggests) either divides the incoming stream into 48-byte cells for transmission over the network or reassembles the cells into packets.

The ATM layer is responsible for adding the 5-byte header to each cell. It also determines the path that a cell will take between switches and adds that information to the header. Further, the ATM layer takes care of error correction. In order to hold down the processing overhead at an ATM switch, error correction is only performed on the header. Most packet networks use error correction on the entire message. An ATM switch can thus work blazingly fast, but data errors will not be discovered until the destination is reached.

The bottom layer, physical transport, includes the interface to the physical medium, which is generally fibre optic cable. ATM's wide area roots can be seen in the fact that it was originally designed to work with Sonet/SDH (synchronous optical network/synchronous digital hierarchy), which allows data to be transferred from 51Mbps to 2.4Gbps. Since Sonet is not yet widely implemented, ATM has been extended to work with US T1 (1.544Mbps) and T3 (45Mbps) lines.

Adaptation Issues

Most of the recent activity in the ATM standards groups has centered on the adaptation layer. The big issue is how to combine voice (which doesn't need much bandwidth but requires constant throughput if quality is to be maintained) with data (which can exhibit

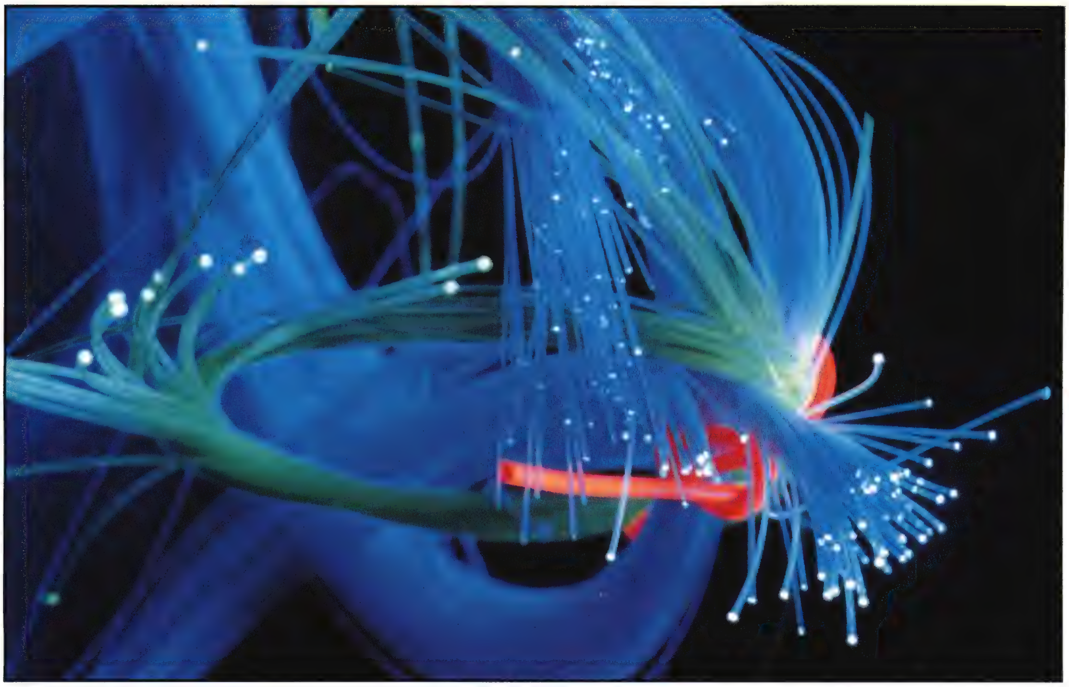


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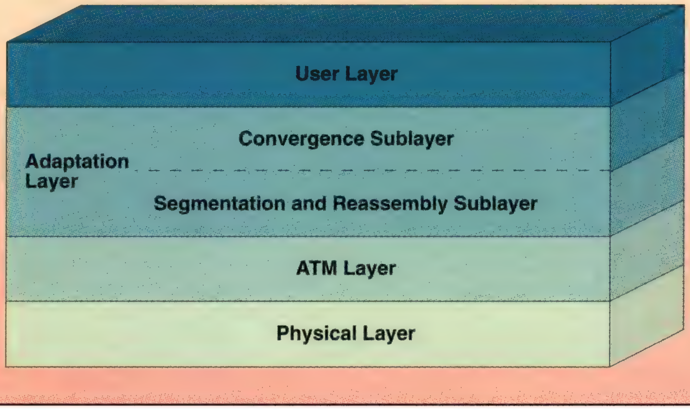
Figure 1: ATM, a Model Technology

The four-layer model that forms the basis of ATM defines how different types of traffic can be mixed on the same switched network. The convergence sublayer makes sure that different types of traffic - voice, video, and data - receive the right level of service.



widely fluctuating demands for bandwidth). This was not a problem with conventional transmission schemes, such as those based on time-division multiplexing, since each type of traffic is given its own dedicated channel. ATM, in contrast, mixes all traffic on the same channel (which is the same as saying that all the bandwidth is created as one channel).

The adaptation layer establishes four classes of service. Class 1 emulates a dedicated circuit for a voice call; Class 2 is intended for audio and video; Class 3 is for connection-oriented data; and Class 4 is for connectionless data. Each class adds its own header to the 48 bytes available for the payload, thus cutting down on the number of bytes available for messages. Class 1, for instance, uses 1 byte to determine if a cell has been lost. Class 4, by comparison, uses 4 bytes to indicate, among other things, where a cell is in a message. This helps the ATM switch determine when the entire message has arrived. Given the limited payload available, the ATM Forum is justifiably concerned with conserving as much of it as possible. To this end it has created Class 5, which does not add an adaptation layer header to data cells. Although this puts a little more of the burden on the switch, the tradeoff was deemed acceptable.

On an ATM network, all transmissions that enter an ATM switch are divided into cells, mixed together, and then shipped out onto the network (see Figure 2 on page 30). If Sonet/SDH has been deployed, the wide area bandwidth has already been divided into slots, and the switch is responsible for assigning cells to free slots. Since the cells are so small, they can be assigned to slots quickly; there is thus very little delay.

By defining slots, Sonet/SDH makes the switch's task simple. With many LAN transmission schemes, an ATM switch must add synchronisation and framing so the receiving switch knows where cells begin and end.

Cell Slowdown

For all its promise, ATM does have problems. For one thing, its relatively short fixed cells are not very well suited to data transmissions. The 53 bytes now accepted as standard, in fact, represent a compromise between the 37 bytes (5-byte header, 32-byte payload) favoured by the voice interests on the international standards bodies and the much larger payloads favoured by the data interests. The voice side argued that by keeping the cells short, voice messages wouldn't end up stalled behind long data messages. The voice interests prevailed, but the victory was not without its price. Consider that a 2,000-byte data message being sent over an ATM network must be divided into 42 cells, each of which has its own header. All this slicing and dicing adds between 10 and 15% overhead to the amount of data being sent across the network.

Actually, even though ATM is now virtually synonymous with fixed-length cells, some early broadband advocates on ATM working groups and committees argued in favour of variable-length packets (such as those found on X.25 networks and LANs). IBM, among others, was a staunch opponent of fixed cells. It repeatedly pointed to the efficiency of a prototype fast packet switch it had built, called Paris (Packetise Automatic Routing Integrate System), that accommodated messages of up to 2,000 bytes. IBM argued that variable-length packets would add less than 5% overhead to messages (and typically, only 1% for long messages). Now that the fixed-cell scheme has been adopted, however, IBM has stated that it will fully support ATM.

The decision to go with fixed cells does carry with it one conclusion: ATM only makes sense for data at very high speeds. That means that other technologies, such as frame relay, will surely have a place on tomorrow's corporate networks.

ATM has other shortcomings, most notably its lack of support for switched virtual circuits. This will further slow its acceptance in the wide area. Switched virtual circuits (SVCs) are typically used to establish connections between individual workstations, with sessions lasting only as long as needed. Once a connection is no longer necessary, it's torn down.

ATM at this point only supports permanent virtual circuits (PVCs), a link that is typically used between devices (such as routers) that must always be connected. A PVC is defined from the perspective of its end-points; the actual route taken through a network may vary with each exchange. This means that devices linked by a PVC must maintain tables that keep track of all connections and their status. For this reason, PVCs are typically used when only a few connections are needed. But if a workstation were to be joined with its peers via a PVC, it would have to maintain a table listing every other workstation on the network that it might possibly communicate with.

So for the moment, ATM's reliance on PVCs is acceptable, since it will be initially deployed over the campus to link bridges, routers and hubs that tie together departmental LANs rather than extended all the way to the desktop. But switched virtual circuits must be added to the ATM specs before networks reach the point at which the number of PVCs become unmanageable and before ATM interfaces appear on workstations. Work on switched virtual circuits is proceeding apace, but implementations are at least a few years away.

Throttling Back

Another vital issue that must be addressed is how congestion management and flow control are going to be handled on future ATM networks. Although neither may be much of a problem on the campus, once ATM is extended over the wide area they both become critical.

If ATM switches are used to establish a 155Mbps link between two buildings located, say, 1,000 metres apart, only a few cells will be in transit at any one time. (Although the industry is accustomed to thinking of the length of a cell in bytes, it's also true that when a cell is transmitted over a wire, it can be viewed as having a physical length. A short wiring run would thus only accommodate a few cells). Sophisticated congestion management is not an issue when only a few cells are involved, since if the receiving switch signals the sending switch to throttle back, hardly any cells are passed over the wire in the time needed to send and respond to the flow-control message. But as the distance between ATM switches increases, flow control and congestion management become a big problem.

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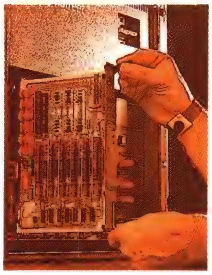

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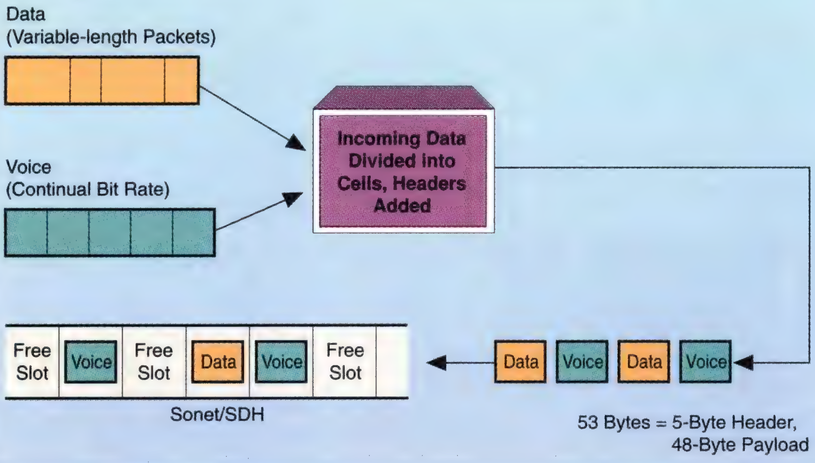
Figure 2: Making the Switch to Cells

An ATM switch takes all incoming packets, divides them into 53-byte cells, and then retransmits them onto the network. If Sonet/SDH is being used, the available bandwidth has already been divided into slots.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Voice
(Continual Bit Rate)
Incoming Data Divided into Cells, Headers Added
Free Slot
Voice
Free Slot
Data
Voice
Free Slot
Sonet/SDH
Data
Voice
Data
Voice
53 Bytes = 5-Byte Header, 48-Byte Payload

on the link at any time would be nearly 5,500. If the receiving switch becomes congested and sends a message telling the originating switch to slow down (the way that congestion is typically handled on a WAN), another 5,500 cells will have been sent by the time the message arrives. And even more will be shipped, since the originating switch can't act immediately upon receipt of the throttle-back message.

Admission control tries to address this problem; in fact, it tries to sidestep the entire issue by making conventional flow control unnecessary. Instead of sending messages over the network once congestion is detected, admission control requires the station requesting a connection to characterise that request in terms of type of service and amount of bandwidth needed. The ATM switch then decides if enough resources are available to accommodate the request. If there are, the connection is established. If not enough bandwidth is on tap, the request is denied and the initiating station has to try later.

The main drawback to admission control is that it forces the initiating station to determine connection requirements. Further, there is as yet no way to deal with a connection request that misrepresents its needs.

Another problem with ATM flow control and congestion management is how to mix different types of traffic and ensure that each receives the necessary level of service. At the moment, the solution is fairly conventional: Establish a separate queue for each priority. When the bandwidth becomes available, the switch ships out cells with the highest priority.

Obviously, congestion management and flow control are needed before ATM can be deployed over the wide area. The ATM Forum has made finding a solution a top priority. Still, it will take time for proposals to make their way through working groups and committees and come up for approval. Since the ATM Forum and international standards bodies must agree on whatever approach is taken, it looks likely that nothing will be in place until the second half of the decade. In the meantime, vendors may try to deliver proprietary congestion management systems. This is acceptable only if users intend to build their networks using hubs, routers, WAN switches, and public network services from one vendor.

LAN Links

How LAN applications will link to ATM networks also is unresolved. And until standards are formulated, it will be nearly impossible to bring ATM to the desktop. Higher level protocols such as TCP/IP, IPX, or NetBIOS typically use names to locate LAN applications. If these applications must cross an ATM network, the higher level names must be translated into ATM addresses. It's unrealistic to expect the LAN application to map the names to the ATM addresses. An entire protocol and directory service will be needed. This issue is sure to get attention as ATM moves to workstations; if not resolved, it could significantly slow implementation.

The issue of flow control also extends to LAN applications using an ATM network. If the network becomes congested, it needs to tell the application to slow down. If the network simply delays traffic, the session may time out. To date, nothing has been done on this front.

Robin Layland

In the July edition of

AUSTRALIAN
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Wireless LANs

Closer to Cutting the Cord

Like the proud parents of a precocious preschooler, developers of wireless LAN products aren't shy about making lofty predictions for their progeny. When it grows up, wireless technology will make the world of office computing a better place, say those who make and sell wireless products. The ability to shoot data through the air at multimegabit speeds will give rise to a new approach to local networks, one in which users are free to roam from their offices to conference rooms to the executive washroom without losing their link to the LAN lifeline. Wireless advocates already have a name for this new approach — they call it nomadic computing.

The future for wireless LANs may be as bright as developers suggest, but wireless technology remains a long way from fulfilling their ambitious forecasts. Current offerings serve mainly as adjuncts to wire-based LANs, replacing the last few metres of cabling in locations where LAN wiring is impractical or prohibitively expensive. Although improvements have been made, the range and throughput of today's wireless products are limited compared with the fastest wire-based networks. In addition, wireless LAN standards do not yet exist, which means today's products comprise a hodgepodge of proprietary technologies.

But in the US, where most product development is undertaken, two pending developments should help chase some of these clouds away and help speed the progress of wireless technology around the world.

First, the US Federal Communications Commission (FCC) is set to dedicate part of the radio frequency spectrum to wireless office networks, which will mean US organisations will be able to install interference-free wireless LANs without having to play the FCC licensing game. Note that in Australia, the position is much clearer and the Department of Transport and Communications (DOTAC) has made available several frequency bands (915-928MHz, 2.4-2.45-GHz, 5.725-5.875GHz and 19.15-19.21-GHz) for wireless LANs. A $29 Class A licence fee is currently payable, but DOTAC says that this is now under review.

Second, the IEEE is now drafting a standard that will define a single media access control (MAC) protocol for wireless LANs. The standard, called IEEE 802.11, won't preclude the use of different wireless transmission techniques, but it will define their implementation. Products that conform to the emerging IEEE standard will be able to work together — a first for wireless LAN offerings.

It will take some time — the rosiest projections say at least two years — for standards and new licensing rules to come together to create the right environment for the wireless applications now envisioned. If all goes well, wireless LANs are likely to undergo a tremendous change. Rather than fitting into the wire-based LAN architecture, wireless LANs will have a design all their own, one that lets users equipped with portable PCs access LAN resources from anywhere in an office building or campus. The Internet Engineering Task force (IETF) is now working on a network infrastructure that can handle mobile nodes, based on a modified version of TCP/IP.

Until wireless technology makes this transition, vendors will continue to sell wireless products that work within the wire-based framework. These proprietary offerings generally comprise wireless adaptors and hubs or transceivers that can be attached to existing equipment.

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the type of transmission scheme used. Wireless LANs use one of three methods to transmit data: spread spectrum radio, narrowband radio, or infrared light. Spread spectrum networks send data from node-to-node by spreading a radio signal over a broad frequency using redundant data bits. This procedure theoretically makes the transmission inherently secure, since only receiving stations that know the transmission pattern can unscramble the signal. Narrowband systems also use radio signals to send data, but their transmissions are confined to a single frequency. This difference makes spread spectrum less efficient than narrowband when it comes to the use of bandwidth frequency.

Infrared products transmit data using light waves just below the frequency of visible light. Because this frequency is much higher than that of radio waves, infrared LANs have the potential to offer higher transmission rates than spread spectrum or narrowband products. Some existing infrared products match the wire speed of today's Ethernet and Token Ring networks. But because infrared systems use light waves, their signals cannot penetrate solid, opaque objects. Most infrared products require a direct line of sight between transmitting stations, a stipulation that severely limits the use of infrared technology. Spread spectrum and narrowband radio transmission do not require direct lines of sight.

Frequency Progress

Although infrared technology offers the highest throughput rates, its inability to penetrate solid objects and its relatively limited distance ranges will limit its appeal as a wireless LAN solution. Most observers assert that the future belongs to spread spectrum and narrowband systems.

Allocation of radio spectrum reserved exclusively for wireless office communications could be the most important step in enabling wireless LANs to break out of their current niche.

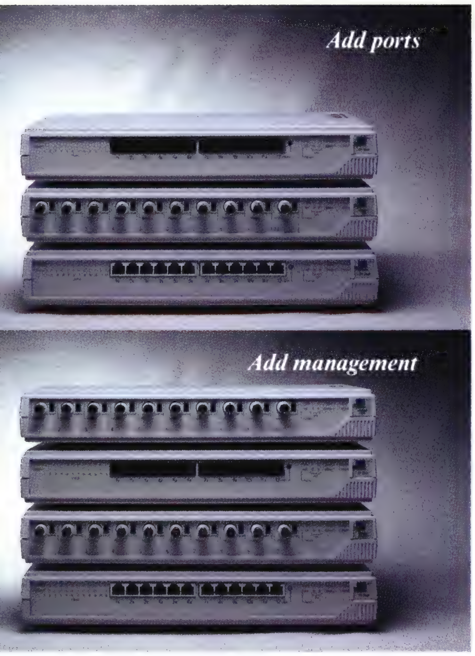
In the US, spectrum allocation is still being resolved and the FCC is in the process of allocating 220MHz of spectrum bandwidth to what it calls personal communications services, a category that covers a variety of offerings, including wireless wide area data links and cellular voice networks. (In Australia, Ericsson's Freeset cordless PABX operates in the 857-861MHz band, although other cordless voice products will probably slot in elsewhere.) The FCC's current plan calls for 20MHz of that total to be dedicated to wireless office applications at a frequency of about 1.9GHz.

The consensus among wireless LAN vendors is that the FCC's plan gives them enough spectrum to support spread spectrum or narrowband LANs operating at 10Mbps, the current line speed of Ethernet networks. A bigger chunk of spectrum theoretically would enable vendors to develop faster LANs — a potentially important consideration, given the fact that wire-based Ethernets are likely to jump to a 100Mbps standard in the next few years. A vendor group called the Wireless Indoor Networks Forum (WIN Forum) is now lobbying the FCC to increase the frequency allocation for wireless networks. So far, however, the commission is staying with its 20MHz plan. WIN Forum's members include a few industry heavyweights, such as Apple, Hewlett-Packard and IBM.

As part of the frequency allocation, the FCC will not require wireless networks operating in the assigned range to be licensed. Because the frequency will be dedicated to carrying LAN traffic only, equipment will not have to contend with interference from other radio sources, such as cellular phones, garage door openers, and security systems.

The FCC's choice of 1.9GHz could be crucial factor in enabling vendors to bring affordable wireless products to market. If the FCC had chosen a frequency higher than

ub, a *hub*, and a **hub**.



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A Selection of Wireless LANs

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Motorola Cray Communications (02) 451 6655	Altair Plus II	Wireless transceiver supporting up to eight PCs over cables: wireless hub	Narrowband; 18GHz	5.7Mbps; 40m
NCR Corporation Datamatic (02) 449 8133	WaveLAN	Combined ISA or MicroChannel adaptor and wireless transceiver; wireless hub	Spread spectrum; 902 to 928MHz	2Mbps; 244m
Proxim Datamatic (02) 449 8133	RangeLAN	Combined ISA or MicroChannel or Compaq laptop adaptor and wireless transceiver; combined parallel port network adaptor and wireless transceiver	Spread spectrum; 902 to 928MHz	242Kbps; 244m
Windata ITS (02) 240 1500	FreePort	Wireless transceiver supporting up to eight PCs over cables; wireless hub	Spead spectrum; 2.4 to 2.4835GHz or 5.746 to 5.83GHz	5.7Mbps; 79m

2.5GHz, wireless LANs would have had to incorporate very expensive gallium arsenide chips, potentially making them too costly to gain market acceptance.

Although the FCC's plan for frequency allocation is well known, it isn't likely to be enforced anytime soon. Wrangling over frequency allocations continues. Adding to the problem is the fact that no agreement has been reached regarding who should pay to relocate existing US Government-operated links in the 1.9GHz band.

A Movable Feast

Once frequency allocation issues are resolved, the wireless LAN market should open up considerably. Several major vendors are expected to enter the wireless LAN business, including Apple, HP, IBM and Ungermann-Bass. For these vendors, the main allure of wireless LANs is the concept of nomadic computing. In these envisioned mobile networks, users equipped with laptop, notebook, or palmtop PCs can access LAN resources from anywhere within a building. This liberation from the desktop opens a wealth of application possibilities, including more efficient use of e-mail and groupware packages.

One issue that needs to be settled regarding mobile LANs is network speed. The IEEE wireless LAN standard is expected to define a range of acceptable speeds, leaving the choice of data rate up to individual vendors. Some developers believe that for wireless LANs to gain acceptance, they have to offer throughput that at least matches the speeds of today's wired LANs.

Others think the cost of bringing wireless systems up to today's Ethernet or Token Ring speeds would be prohibitive, and that the kinds of applications anticipated for mobile LANs could run at lower speeds.

Lower speed networks would enable more LANs to operate in different frequency channels in one area of a building without incurring interference problems.

With faster wire-based technologies like 100Mbps Ethernet and asynchronous transfer mode (ATM) networks on the horizon, it's obvious that wireless technology won't be able to compete with wired products for mainstream networks. However, there are some wireless products appearing that do manage high speeds, specifically the infrared products from Jerusalem Optical Link Technologies (JOLT, represented in Australia by Hanamax Marketing Services), which the company says can support data rates of between 5Mbps and 125Mbps for distances of over 125 metres.

Work on a network infrastructure that can cope with mobile nodes is in full swing within the IETF, and some say a standard defining a mobile IP protocol could be ready next year.

The IETF's work is intended to complement that of the IEEE. The group hopes to develop a mechanism that lets nodes change their physical location without having to change IP address. Three separate proposals for a mobile IP standard have been put before the IETF — from IBM, Columbia University in New York, and Sony.

Standard Solution

The lack of interoperability between products from different vendors is another issue that must be addressed before wireless LANs can gain widespread acceptance. Vendors are pinning their hopes on the IEEE 802.11 standard to solve this problem.

When completed, IEEE 802.11 should bring about product interoperability, but users looking to the standard to simplify the process of choosing a wireless LAN technology will be disappointed. The IEEE 802.11 committee is working on developing a single MAC-layer protocol that can work with spread spectrum, narrowband, or infrared systems at a range of network speeds. The IEEE successfully used this approach — designing a MAC protocol that works independently of the underlying physical layer — with the 802.3 Ethernet standard. Under 802.3, the CSMA/CD MAC-layer protocol defines how Ethernet nodes send and receive data; the 10Base-2, 10Base-5, and 10Base-T additions to the standard define how the Ethernet works over different cable types. By using this same approach with 802.11, the IEEE hopes to make the wireless LAN standard applicable to any present or future wireless transmission technology.

The approach does have some critical drawbacks, however, For one, network managers will still have to make tough choices between very different wireless technologies. Further, products that conform to 802.11 but that use different frequencies will not be able to communicate without some sort of frequency-converting bridge.

Some observers, however, contend that a single MAC protocol for all wireless networks is unrealistic.

The IEEE 802.11 working group has started to hammer out some of the details for the wireless spec. The standard will define networks with speeds from 1 to 20-Mbps, supporting packetised voice as well as data traffic, mobile nodes, and broadcast packets. Registration and authentication will ensure security, and Token Ring and Ethernet packets should run over the wireless network unchanged.

The IEEE's work on its wireless standard is not exactly proceeding at breakneck speed. Production of IEEE 802.11 is already running four months behind schedule, and a draft version is not expected to be available until November at the earliest. Even this timetable may be overly optimis-

Continued on page 43

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LAN VIEWS

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Graeme Le Roux

Like most people who have anything to do with computing I get a large amount of Earth-shaking product information, most of which I file under 'recycling.' Lately I seem to be getting many vendors' 'Visions of the Future.' These visions seem to contain a number of contradictions, not to mention possible collisions with practicality and/or the laws of physics.

Vision One: workgroup computing, the client-server platform and desktop bandwidth. This particular view of the future justifies the latest in network hardware and MAC layer standards in terms of the 'new' client-server platform. The logic seems to be that since each workstation will be a client-server you need to buy equipment which will boost your system bandwidth (for example ATM or the copper versions of FDDI). This completely ignores the fact that most PC networks in this country, even those which are badly designed, have an average utilisation equal to around 10% of available bandwidth. By careful application of routers and bridges, networks comprising thousands of PCs and hosts can be built from either Ethernet or Token Ring. There are organisations all over Europe and the US that have been running networks of this size for years. The only problems which have consistently appeared are related to backbone bandwidth limits. In the US this is typically resolved by redundant, high bandwidth point-to-point WAN links and multiple — typically fibre — local backbones. In Europe, X.25 is often preferred to point-to-point technology. These systems are beginning to grow out of their current technology — hence the advent of frame relay, ATM, et al. The other major argument for high bandwidth is that current and future high performance client-server platforms 'require' more bandwidth.

Client-server computing certainly requires more computing power, but it does not necessarily require higher network throughput. The point of the client-server model is to increase system response and minimise the load on system resources by dividing processing into a number of, reasonably general, individual and largely self-contained tasks. Each task is run on a processor which is configured specifically for the task it is to perform. Communication between tasks is minimised. In other words, your PC makes specific, small network requests to remote processes and, in most cases, receives reasonably small responses — as opposed, say, to an entire multi-megabyte data file. Your PC will probably make lots of such requests, resulting in lots of small packets on the network, but the rate at which traffic is generated is dependant upon the PC's ability to handle the data. That means moving it between memory or disk and the network adaptor. The network adaptor is generally not the limiting factor. The rate at which electrical signals can move inside a PC is governed by the laws of physics and the cost of obeying them. High performance typically requires the use of expensive, tight tolerance, low power components and equally expensive precision manufacturing processes. That is why high performance workstations have very small mother boards and a large price tag. How many customers will pay more for their PCs just to be able to increase their potential network throughput so they can spend more on high bandwidth network equipment especially when, in most cases, current technology properly applied will handle their requirements?

Then of course, there's Vision Two: wireless networking, pen-computing and personnel digital assistants. This vision sees us all equipped with electronic note pads which allow the user to wander the world, or at least the office, working away, reading e-mail, etc. all without falling down stairs or tripping over furniture. The idea of a clip board size PC that you can write on is great, and when mature product arrives I'll be at the head of the queue, but it has its limits. First of all, while it will be great for notes at seminars, lectures, etc. and for working in taxis, trains and on aircraft, I refuse to write anything of any length, e.g. this column, with an electronic ballpoint. I want a keyboard and I want a mouse. Similarly in an office I can see executives scribbling notes at meetings, stenographers abandoning traditional pads for shorthand work and receptionists scribbling electronic 'while you were out' notes, but I can't see too many word processor keyboards gathering dust nor programmers writing, as opposed to typing, code.

Now, for the most part, pen computing proponents agree with this point of view, but they still expect to sell pen-based computers in place of standard PCs. But if I have two machines, which would seem likely, I need two network ports. This in turn means either twice the wire, a concentrator in each office or a multi-drop cable scheme — each of which degrades my management capability. The 'solution,' according to this vision, is a 'wireless' network. Wireless networking is supposed to neatly side step the cable problem by using radio transmission to link PCs and hubs. The cost of installation drops radically and the system provides almost infinite flexibility in that I can move desks, redesign office furniture, etc. with zero impact on network 'wiring.' What this overlooks is that I still have to wire phones and power, so wiring the network, particularly with UTP, can be done at the same time at relatively low cost. All I have to do is plan ahead.

> *"I believe that for the foreseeable future office desktops will be wired with copper."*

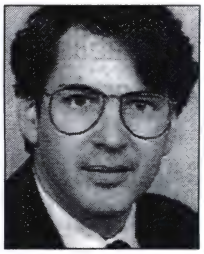
The next issue is that the transmitters for my wireless network will have to be low powered devices. Given current office design this means lots of transmitters. These transmitters will also have to operate on an allocated frequency which will limit bandwidth, so wireless Ethernet is perfectly practical, but wireless Ethernet plus phone means — as now — two different transmission systems (and I still have to wire for power). Of course, if Vision One is in any way true, my desktop PC will require much higher bandwidth and that means increasing the frequency of network transmission which might be unhealthy and, due to the characteristics of HF radiation, would probably prove impractical in an office environment.

While all of these technologies have their place and should be used where appropriate, I believe that for the foreseeable future office desktops will be wired with copper. Cost will dictate that this copper is UTP in most cases. Pen computing may replace notebooks. These pen PCs will, however either dock with a base station or have a 10Base-T port for desktop use. They will use wireless Ethernet in places like warehouses and will most likely use some form of infra-red link to transfer data to desktop machines. Cost will determine just how far and how fast pen PCs displace pen and paper.

Graeme Le Roux is a Director of Moresdawn Pty Ltd (Bundanoon, NSW) and specialises in local area network consulting services.

INTERNETWORKING

Crossover Dreams For Networking Vendors



Nick Lippis

The networking business is caught up in a crossover frenzy. Hub vendors want to sell bridges, routers, and servers. Makers of time-division multiplexers have their eye on the hub and router markets; so do network operating system vendors. Carriers want to sell routers and services based on routing. And just about everyone plans to grab a piece of the emerging market for asynchronous transfer mode products.

Market crossovers could benefit vendors and users alike. Diversification opens the door to new markets, while increased competition keeps prices in line and product quality high. That's how it plays out on paper. The real world is another story. To have any success in a new market, vendors have to do more than add products to their catalogues. They also have to alter their business approach to match their new competitors.

Vendors that compete in specific vertical markets tend to adopt similar strategies — value disciplines, in MBA lingo. For instance, hub makers compete primarily on price and ease of use, while router vendors tend to focus more on product performance. As these companies venture into new markets, they need to adapt their approaches to the value disciplines that prevail in those markets while at the same time bringing to the new markets some of their existing strengths. Companies that fail to achieve this kind of symmetry will have a hard time fulfilling their crossover dreams.

For users, the trick is to figure out which companies are taking the right steps toward adapting to new markets. No one wants to spend money on a product that's doomed by mismanagement.

One adaptation method gaining favour among hub vendors is to strike alliances with manufacturers in other markets. More hub makers are integrating routers, bridges, distributed management, and, in the case of Networth, NetWare server features into their products. Rather than enter these market segments on their own, many hub vendors are recruiting outside help.

> *"For users, the trick is to figure out which companies are taking the right steps toward adapting to new markets."*

One hub maker that has been particularly busy on the alliance front is SynOptics Communications. Rather than build a router for the hybrid Rub System product, SynOptics decided to integrate a router from Cisco Systems. SynOptics also has integrated Cisco's 4000 router into its LattisNet hub. When SynOptics needed to move its hub to an ATM platform, it struck a deal with Washington University to incorporate ATM technology developed at the university into the SynOptics LattisCell switch.

Hub vendors are able to adjust to new value disciplines without worrying much about their core business — market dynamics in the hub business aren't likely to shift away from the emphasis on price. Router vendors are less fortunate. Not only do they have to adapt to new markets, but the value discipline of the router business itself is also undergoing a basic change.

Up to now, the router industry's core value discipline has been product leadership. Router makers have continuously pushed the technology envelope to develop products with faster throughput and more sophisticated features, such as SNA internetworking and fault tolerance. For example, Cisco's recently announced 7000 router is able to pump out 115,0000 packets per second, while Wellfleet Communications is touting throughput of more than 480,000 pps for its Backbone Concentrator Node.

Now however, the low end of the router market is expanding rapidly. New access or boundary routers are linking LANs in remote offices to the corporate backbone network. These access routers demand a different value discipline: they have to be cheap and easy to use. Some router vendors are addressing this issue by hawking no-frills versions of their leading products. Others are going the partnership route. Wellfleet has joined with LAN operating system giant Novell to offer a cheap and relatively easy-to-use router based on a PC server. Specifically, Wellfleet is developing a low-end product that will implement the NetWare Link Services Protocol (NLSP), Novell's proprietary link-state routing algorithm. NLSP allows much faster reconfiguration of NetWare IPX networks around failures than was previously available. The partnership gives Wellfleet and Novell capabilities they couldn't develop on their own. It also serves as a barrier for competitors looking for prominence in this part of the router market.

While the hub market is driven by price and the router business by technology, the carrier and multiplexer markets are decidedly focused on establishing and maintaining long-term customer relations. For example, many carriers around the world have tariffed their virtual private network (VPN) offerings on the basis of volume and longevity to win customer loyalty.

Although carriers have had some trouble adjusting to the data services business, they are now coming on strong with new technologies like ISDN, frame relay and metropolitan area networking. Like carriers, multiplexer makers have long competed by nurturing long term customer relationships. Unlike vendors in other markets, however, mux makers have little choice but to seek out new markets — the mux market has matured almost to the point of obsolescence. To branch out into new businesses, veteran outfits like Ascom Timeplex, Network Equipment Technologies (NET), and Newbridge Networks have set up subsidiaries. The strategy is for these subsidiaries to act as incubators for new technologies that can then be passed on to the parent companies.

Among the mux vendors, NET is furthest along with this approach. It set up a subsidiary, Adaptive, to develop ATM and Sonet technology and has now folded the subsidiary back into the parent organisation. NET's goal is to integrate Adaptive's ATM and Sonet products with NET's flagship IDNX product family and to capture the ATM hub market it recently helped define. The inherent danger of this approach is the culture conflict caused by merging two distinct entities.

It seems as if every player in the networking industry is trying to be something it's not. While it's relatively easy to buy technology to develop a new product, the hard part is making sure that the organisation has the right value discipline matched to the market. As equipment makers and carriers extend beyond their market boundaries, they are going to have to redefine themselves to varying extends. Network managers will have to evaluate how each player is handling the transition to determine which ones deserve their business.

Nick Lippis is President of Strategic Networks Consulting. He is based in Rockland, Massachusetts.

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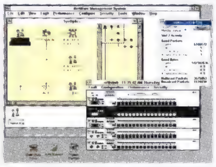

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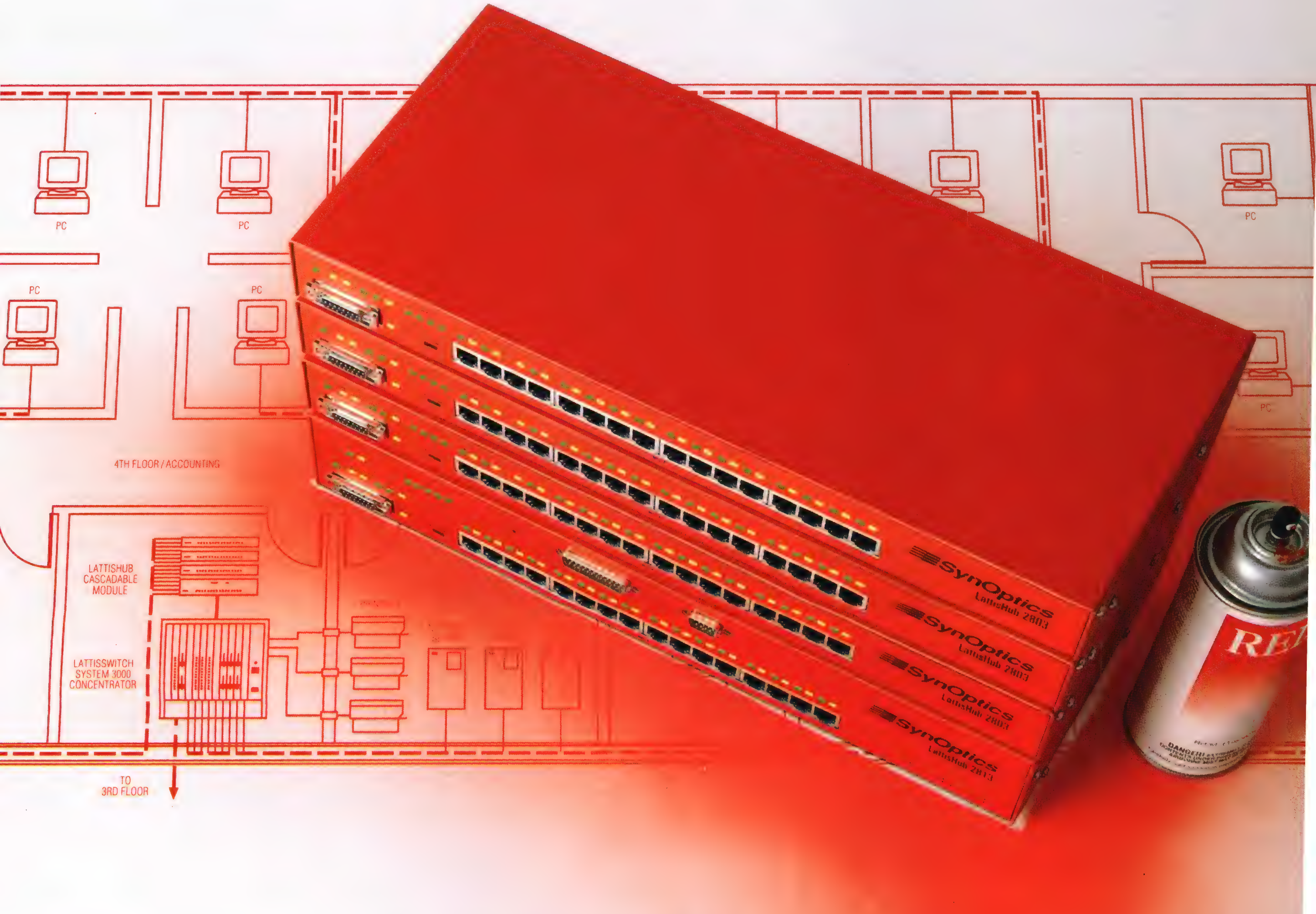

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OSI Tutorial

Some Standard Arguments For OSI Sceptics

Alan Lloyd

In over ten years of giving public presentations about networking and OSI, I have heard just about every type of OSI question and comment imaginable. Some of these questions and comments are so frequent that anyone working in the OSI area needs to have a ready response, as they relate to some of the more common misconceptions about OSI.

Though Open Systems Interconnection is, to many, a dry, technical subject, I have heard the odd humourous (usually anti-OSI) comment. The most notable comment I have ever had came from a proponent of proprietary technology. "Don't get locked into open systems," he warned.

Another clever put-down of OSI is: 'With OSI, after all is said and done, more is said than done!' And, to round off the trifecta, try: 'The problem with OSI acronyms is that once they are expanded, one is none the wiser!'

These statements should be met with only a loud laugh. However, others do deserve a more considered response.

'OSI is dead' is a statement frequently voiced. This one is easily countered. Given that OSI is defined as 'a framework on which standards can be developed for distributed information systems,' and that international standards are produced by the CCITT, ISO and IEEE, we need only look at who is using products incorporating the technologies defined by international standards.

The thousands of CCITT standards, or recommendations, cover all aspects of carrier networks. The carriers actually drive the CCITT formulation process. Joint work is also done between ISO and CCITT. So, in response to the 'OSI is dead' statement, point out that PSTN, X.25, ISDN, B-ISDN and ATM, and facsimile standards; the OSI Transport, Session and Presentation layers; as well as applications such as X.400 messaging, X.500 directories and X.700 management, are all defined in CCITT recommendations and ISO standards.

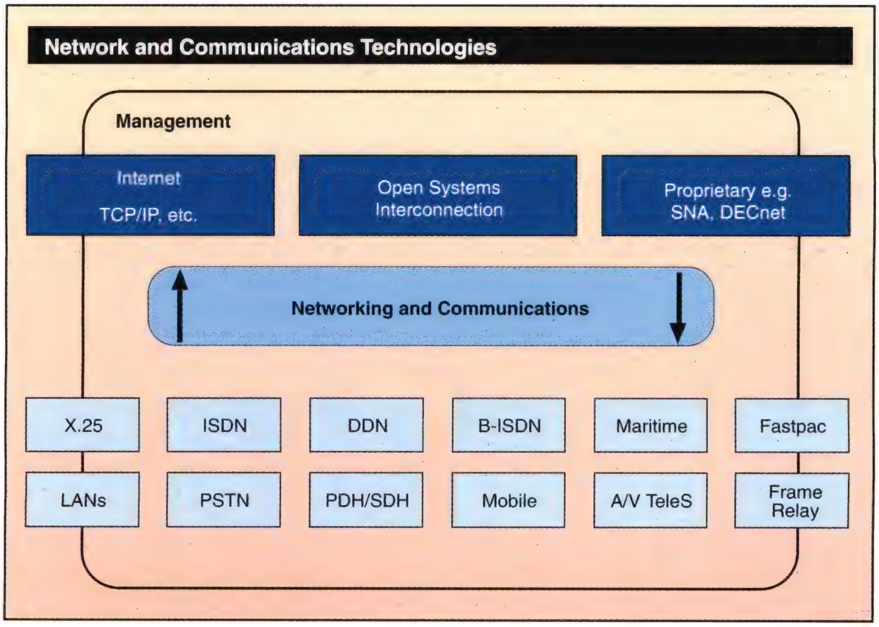
These standard technologies have been or are being implemented by the hundreds of carriers around the world. If OSI is dead then the world's biggest networks shouldn't be working. The figure below gives an indication of the standardised network and communications technologies.

Use the same response when confronted with the argument that there are no products for OSI. You might also add that over 100 carriers worldwide have publicly demonstrated X.400 messaging and that most vendors have been publicly demonstrating OSI products since 1985. Finally, mention the LANs, WANs and the major implementations of X.400 and FTAM in Europe, the number of Telecommunication Management Networks (TMN) and so on.

This is one of a series of open systems tutorials by Alan Lloyd, Strategic Developments Manager for Datacraft Australia. Alan represents Australia on numerous international standards bodies and is the co-author with Gary Dickson of *Open Systems Interconnection* (Prentice Hall, 1992).

Note the distinction between communication and networking technologies. The standards-based technologies are all at the communications level with OSI (CLNP, ES-IS, IS-IS and OSI Transport) at the networking level. (PDH and SDH are the digital hierarchies used for transmission trunk systems.) With the exception of proprietary and de facto standards, such as TCP/IP, all of these technologies are defined by CCITT, ISO and IEEE.

From a carrier's perspective, TCP/IP and the proprietary technologies are just carried as bits on the wire. The carriers do not implement these technologies as national and international communication services, though they sometimes use these de facto/proprietary technologies for internal functions. But as we move to global trading and global networks, the technologies used must be those defined by international standards. I think some of the suppliers of network technologies have not accepted this point yet.

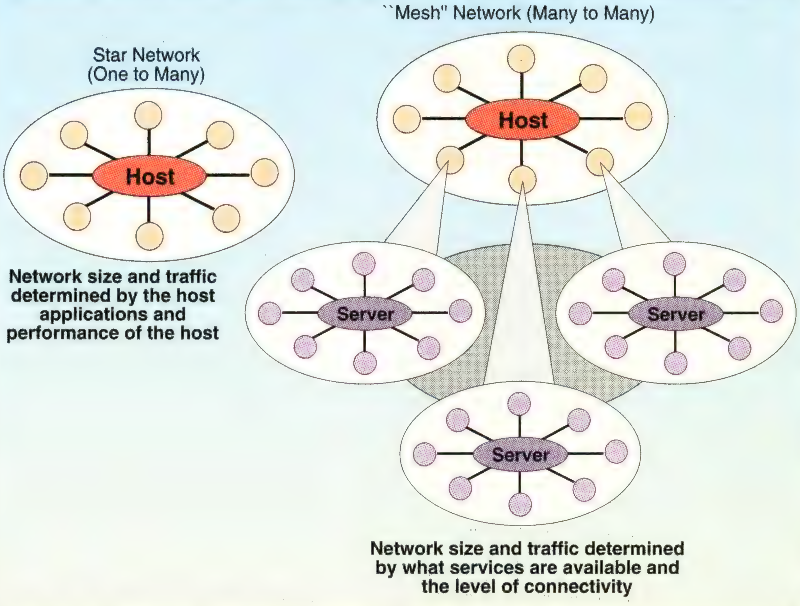

Network and Communications Technologies
Management
Internet
TCP/IP, etc.
Open Systems Interconnection
Proprietary e.g. SNA, DECnet
Networking and Communications
X.25
ISDN
DDN
B-ISDN
Maritime
Fastpac
LANs
PSTN
PDH/SDH
Mobile
A/V TeleS
Frame Relay

Double Speed Standards

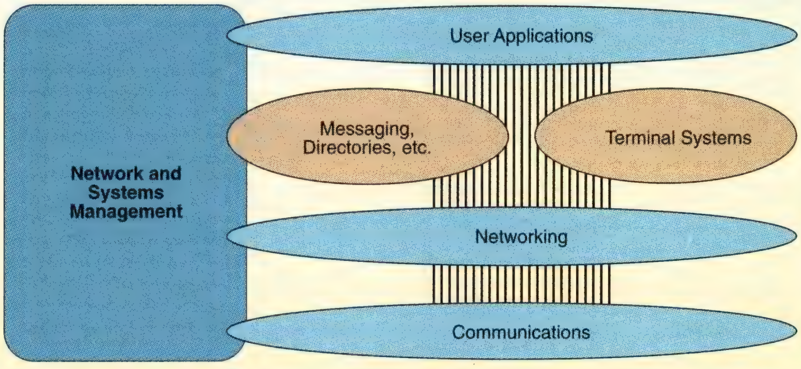
Another frequent criticism is that OSI is slow! A good way to respond to this is by observing the widespread acceptance that users cannot run Microsoft Windows applications on an Intel 80286-based PC. Users instinctively upgrade their PCs to a 386 processor or better to get the computing power required by Windows to provide its range of functions. There is usually no de-

Network Design Issues

Host Centric and Logical Mesh Networks


``Mesh" Network (Many to Many)
Star Network
(One to Many)
Host
Host
Server
Server
Server
Network size and traffic determined by the host applications and performance of the host
Network size and traffic determined by what services are available and the level of connectivity

Logical Network Design



OSI is considered difficult to implement because the methodology of putting in networks today is complex. OSI is, in fact, being used as a fall-guy. The real problem is that with network design today one is really addressing a multitude of issues.

In the area of network architectures, there is a shift from centralised to distributed architectures. In processing environments, there is a shift from centralised hosts to distributed PCs and workstations. Technologies are moving from proprietary to standards-based and are requiring integration. Application architectures now give users the choice of where application services are placed on the network and what they are. Business management is moving from local focus to a global perspective. The supplier profile for today's distributed technologies is changing from mainframe vendor to network systems integrator.

In message-based networking, there is a change from transaction/terminal networking to message/file-based networking. Designers must consider the changes in network characteristics from determined message size and rate to variable size and rate, from single instance message to copy and multicast services, from central information model to distributed information model and from central management to distributed management.

Some users approach network design by trying to address the task with either a host-centric approach or just a list of protocols. Typically, they put in a TCP/IP router network, connect the host equipment to the routers to carry SNA and 3270 sessions over the top of TCP/IP and then connect LANs to the routers for the PCs and servers. It is all managed with SNMP.

Though this methodology may work for networks of a specific scale, the networks of today are not host-centric or a set of interconnected protocols. A small network will not be a problem, but a small network with design problems can turn into a big network with minefields.

Networks are changing from host-centric, in which the network traffic was governed by central host applications, to a logical mesh. On the host-centric network there is no other network traffic as far as the host is concerned. In the logical mesh case, the traffic on the network is dependent on what services are made available to the user. So the network must respond to the user's need to access any service they want, when they want it. With host-centric, the host controls the network; with logical mesh, users can collectively crash a network. The major aspect of this transition is the move from a terminal-based, transaction-based system to a message/file-based system, though the network usually incorporates both types of traffic.

In today's networking environment, the IT manager is facing a number of major network design issues. These issues are not just technical, They also embrace a wide range of commercial and operational issues. To address the technical issues and this shift in both connectivity and network traffic types, a logical model is needed. This logical model should identify the areas of communications, networking, terminal access, messaging and user applications.

The network logical model addresses several levels. At the communications level it embraces one or more carrier services and communications technologies like ISDN, X.25, Fastpac, frame relay, ATM and bandwidth on demand requirements.

At the network level, it integrates the de facto standards of TCP/IP for Unix and distributed processing, and adopts OSI standards when appropriate for network scale and global interworking. At the terminal service level, it supports current host-centric proprietary applications and terminal systems. At the messaging level, it deals with the move from terminal to message/file-based networks, determines the role of directory systems and name servers, and determines dynamic bandwidth on demand requirements on the communications level for the message/file transfers.

Overall, the model must support the current investment in host-centric proprietary network architectures, integrate the management systems to reduce the cost of operation, and allow the adoption of new communications and network technologies on a cost benefit basis. In next month's edition we'll look these issues in more detail.

bate that Windows is 'slow.' Instead, the argument is that the PC cannot handle the functions provided by Windows.

Yet in the OSI environment, if X.400 messaging functionality (i.e. internationally standardised distributed system functions for global messaging) is installed on a 286 PC and operates slowly, the OSI X.400 technology is somehow at fault!

Functionality requires computation and storage resources. If OSI technology is to provide global distributed system functionality, it needs realistic resources.

Who's Insecure?

Some critics of OSI claim that OSI and open systems are insecure. My response is to enlighten them on the nature of standards. OSI and open systems are about developing products that incorporate technologies defined by international standards. Technologies defined by standards are also used in constructing houses, cars and aircraft. The use of standards simply defines a construction technique. It is the application of that construction technique which solves or creates problems.

For example, you can build a house using standards-based materials, but if the door is left open, the house is insecure. Security is an issue of usage or 'productisation,' not one of construction. As OSI standards are implemented in products, standards-based technology can be supplemented with additional product features to provide additional security. The productisation process permits this.

The operational and administrative management parts of a product, including that of security management, are therefore productisation issues, not standards issues. Users can implement the security framework standards for security if required, or implement the security features of the product in a proprietary way if they want 'secure security.' The choice of which one to use is determined in the product specification and design process.

The TCP/IP Question

Some observers believe that TCP/IP and SNMP will replace OSI. It is true that these technologies are being deployed on a wide scale, are cost effective and provide a very realistic and acceptable solution to networking. Some of the application technologies for TCP/IP are Simple Network Management Protocol (SNMP), Simple Mail Transfer Protocol (SMTP) and Trivial File Transfer protocol (TFTP). These applications protocols are less sophisticated than OSI equivalents (CMIP for management, X.400 MHS for messaging and FTAM for files), but provide a good service.

Sometimes simple things are considered the best. However, with the uptake of TCP/IP across the world, the scalability and integrity issues of networking start to creep in. We are now seeing a number statements and new documents (called RFCs) from the Internet community which indicate these technologies are being upgraded to deal with these scaling issues. I personally think that as the world continues to adopt Internet technology, the technology will have to extend its functionality (such as addressing schemes, protocol behaviour and applications functions) to deal with the issues of globally distributed systems. This technology may even end up with the same functionality provided by OSI!

OSI, by contrast was designed by the world's standards bodies for global networking, and you should note the difference between networks that are connected globally and global networks! The addressing schemes, in particular, are different.

Suppliers should take a pragmatic approach to the TCP/IP and OSI migration issue. TCP/IP does provide a cost effective solution to networking. As the network scales up, OSI should be introduced as the network core and TCP/IP sub-nets will then

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become OSI end systems surrounding this core OSI network.

A last observation is that TCP/IP is only a transport and internet protocol. As there are many thousands of CCITT and ISO standards, I cannot really see internet technologies replacing the international standards bodies and the carrier networks.

Swamped by Standards?

'I like working with standards because there are so many of them.' That's a cynical comment, but it masks a real concern. We use standards to define many things, from the construction of cables, chemical and fuel storage, houses, cars, roads, aircraft, safety materials, electrical systems, to the definition of hygiene and pollution levels and quality.

The IT industry, at the demand of the users, is dealing with standardisation process in its own way, with staff cuts and downsizing.

The range of technologies in the IT industry means there will naturally be a high number of standards. However, few standards provide the same functionality and there are many arguments about conflicting standards.

A good example is the debate about whether frame relay will supersede ISDN. Both technologies have been designed by CCITT (the carriers), hopefully for some reason! Frame relay provides connection-oriented level 2 statistical multiplexing over a level 1 service (i.e. the multiplexing of data over some bandwidth). ISDN provides a connection-oriented level 1 service (i.e. the actual bandwidth). The two have different functions. ISDN can support frame relay and other services, frame relay can run over ISDN, leased lines or the digital data network (DDN) if required.

Note that the number of new proprietary technologies is rapidly declining because of the international standardisation process. The world is converging on technologies such as B-ISDN and ATM, so the rate of new standards development should decline.

Conformance Testing

User caution often leads to the comment: 'If the OSI product is not conformance tested I won't buy it and I will use de facto or proprietary products instead.' You should point out that these are not conformance tested either!

The conformance testing issue is a quality control issue in the research, development and manufacturing process. I really do not understand why it is being used to target only OSI technologies. All technologies should be tested with the best tools possible. Datacraft uses internationally recognised quality control procedures (ISO 900x, AS 3563, etc.) and internationally recognised OSI testing equipment (NCC OSI tools) for its OSI product testing.

The use of OSI conformance testing must also be considered in the light of total systems. In a workstation environment with Unix, Windows, database and application software, there may be 500Mbytes of code. The OSI protocol stack is approximately 500Kbytes. OSI conformance testing tests just .01% of the software. It is analogous to buying a car with only the wheel nuts having 'Tested' written on them! The rest of the car is left to the integrity of the car supplier.

The general perception is that OSI conformance testing deals with a far higher percentage of product. Buyers should seriously consider this 'percentage tested' aspect if seeking OSI conformance statements on products.

In the case of the lower four layers of OSI, the communications layers, the testing is a reasonably static process because one is testing point-to-point protocol behaviour and the testing of communications protocols is a widely understood skill.

In the case of OSI applications and an integrated system which uses a range of proprietary, de facto and OSI networking technologies, the user will have to rely on the sincerity, credibility and skills of the local supplier to design, supply, scale, integrate and deploy the total system, just as he has always done.

I should make one closing observation on OSI and conformance. Do we ask to see airworthy certificates on aircraft before we board them? Do we ask for the surgeon's credentials before our eyes close for the operation. No. We put a level of trust in the organisation providing the service. Organisations, including the big IT suppliers, that do not provide an acceptable level of quality in their services and products usually do not survive.

Alan Lloyd

Wireless LANs from page 34

tic, some say, because, unlike other 802 standards that were based on proven technology, IEEE 802.11 is being designed from scratch.

Ironically, the IEEE may have to wait until more vendors bring out proprietary LANs before work on 802.11 gets started in earnest. As more products appear, it's likely vendors will align into groups and put on real pressure for a standard.

The Current Crop

Whatever the future of the 802.11 standard, one thing is certain: Today's wireless LANs won't conform to it. While network managers will be free to continue using these products, they will always be a proprietary solution.

Today's wireless LAN products represent an amalgam of transmission technologies, frequencies, and speeds (see the table on page 34). Their main selling point is their ability to help users save money for installations in which cabling is impractical or inordinately expensive. On the surface, the average cost per node doesn't compare well with wire-based products, but factor in the labour cost involved in network wiring, and the numbers can shift rapidly in favour of wireless products.

In general, wireless LANs are simple enough to be installed by in-house staff — in most cases, users could have a 10- to 20-node network up and running in a few hours. And for organisations that regularly make changes to their networks, the savings can really stack up. The costs involved in connecting a cable from a wiring closet to a workstation and in making alterations to existing schemes can be high, with the biggest variable being labour costs. With wireless networks, these charges are virtually eliminated.

Network managers shopping for a wireless LAN must base their final decision on three criteria: speed, transmission range, and ease of installation. The key factor determining these issues is the type of transmission scheme used.

Spread spectrum systems use frequency bandwidth less efficiently than narrowband or infrared systems, which means they typically offer the lowest throughput. Product improvements have led to the appearance of a few faster spread spectrum nets — Windata's FreePort provides 5.7Mbps throughput, for example. Windata's speed breakthrough is attributable to a technique in which data is sent using one frequency and received in another. FreePort transceivers also exchange supervisory packets to synchronise transmissions and make maximum use of available frequency. FreePort's throughput now matches that of the only narrowband product now on the market: Altair Plus II from Motorola.

Infrared LANs outperform radio-based systems when it comes to data throughput. Some vendors already have systems on the market that provide Ethernet (10Mbps) and Token Ring (16Mbps) throughput, and there are also the 100Mbps+ infrared systems from JOLT which transmit at 'FDDI rates.'

The problem with infrared LANs, as mentioned earlier, is their inability to penetrate solid opaque objects and their relatively limited operating range. Spread spectrum and narrowband signals can penetrate solid objects like office furniture and walls — they do not require a direct line of sight between stations.

Some spread spectrum systems claim internode ranges of up to 300 metres, but for all products operating range decreases in proportion to the number of objects through which the signal must pass. Estimates by spread spectrum vendors regarding operating range in an average office environment vary from about 60 metres to 150 metres.

Narrowband radio signals also can pass through solid objects, but because the frequency they use is higher, they lack both the range and penetration of spread spectrum signals. Consequently, Motorola's product transmits data for a maximum of 40 metres, shrinking to 12 metres when passing through three plaster-board walls.

Some infrared vendors use a technique called diffused infrared to partially compensate for infrared's line-of-sight limitations. Their transceivers communicate by bouncing the infrared signal off walls, ceilings, and other objects. The trade-off, however, is speed and range.

Some wireless products now on the market are based on transceivers that attach to conventional Token Ring or Ethernet adaptors. Others combine a parallel port network adaptor and a wireless transceiver. Obviously, organisations that already have conventional adaptors installed would find transceiver-only products more attractive. Combined adaptors and transceivers are generally a better choice in new sites, where users would have to buy new adaptors anyway.

Another feature distinguishing current wireless products is compatibility with network operating systems. Products that attach to existing adaptors generally are suitable for use with any network operating system, since they carry data transparently. Combined adaptor and transceiver products are compatible only with networks supported by software drivers on their adaptor.

Most of the products that work with existing adaptors support more than one PC per transceiver, with multiple PCs typically connected via short-drop cables. This can have a dramatic affect on the per-node cost of wireless LANs.

Today's wireless products can be installed in conjunction with cabled LANs, enabling a cabled network to be used as a backbone carrying data between wireless subnetworks. Vendors use different methods to bridge between cabled and wireless networks. Some use a PC equipped with both a cable-compatible adaptor from a third-party supplier and a wireless transceiver to pass data between the wired and the wireless network. Others have built integral cable connectors into their products, allowing them to act as a bridge between the two types of network.

A number of vendors also sell wireless bridges that handle LAN links between buildings. Accordingly to them, such products can pay for themselves in a few months by eliminating the need to rent high speed terrestrial circuits.

Stephen Saunders

Technology Update

■ AT&T ISDN Patents Under Fire

A shock decision to grant AT&T patents for some ISDN developments will slow even further acceptance of the technology in the US. The major worry is that threats of legal force from the telecoms giant could curtail new ISDN developments from other vendors. AT&T recently received patents on several Integrated Services Digital Network (ISDN) applications and plans to enforce the patents if necessary. The fact that AT&T received the patents has shocked many users. For instance, one ISDN patent AT&T was granted is called Secure Dial Access to Computer Systems, which lets companies control access to host computers using ISDN's automatic number identification (ANI). The patent for this technology does not specify use of any AT&T service, proprietary piece of equipment or AT&T software, and some users have insisted the technology did not come solely from AT&T, claiming users and vendors worked together to develop the application. AT&T, of course, disagrees. "There is a rigorous review process within the government involved in issuing patents," said AT&T Communications Manager Tim Patterson. "It's our understanding their process is legitimate." He added AT&T would file suit against anyone it believes infringes on its patents.

■ BT, HP, Sun Team to Develop LAN/WAN Interfaces

In an effort to bridge the gap between LAN and WAN management, BT has teamed up with Hewlett-Packard and Sun to develop interfaces that will allow users to manage their LANs in conjunction with BT's WAN services. The three companies are planning to use the Common Management Interface Protocol (CMIP) as the basis for interfaces. The interfaces will also conform to Network Management Forum's Open Management Interoperability Point 1 specification. The interfaces, which are set to be made available by the first half of next year, will provide links between BT's Concert, HP's OpenView, and SunConnect's SunNet Manager, allowing Concert users to monitor and manage their LANs and BT-provided WAN services. The BT, Sun, and HP announcement comes on the heels of a similar announcement made by Microsoft and Infonet Services Corporation. Infonet said it will use Windows NT technology to extend the management capabilities of Infonet's LAN internet services.

■ Novell Announces Network Registry

Novell has announced a new service to customers building enterprise networks, to be called the Novell Network Registry. The service aims to facilitate network administration by eliminating name and address conflicts among geographically dispersed networks. Working with assigned network names and numbers will ensure that network managers have a unique set of network identifiers, which will ensure reliable worldwide communications, said Navindra Jain of Novell. He said the registry would be of most benefit to companies with large corporate networks, or companies who use their network to communicate with other organisations. Customers make use of the service by contacting the Registry to reserve an organisation name, a range of addresses, or both. A unique range of IPX addresses is then allocated by the Registry, with a size matched to the user's needs.

■ New Source For APPN Code

Developers wanting Advanced Peer-to-Peer Networking Node (APPN NN) source code will soon be able to purchase it from a London-based firm called Data Connections. The company is selling APPN NN code which its engineers developed from IBM specs. The new software is known as Systems Network Architecture Protocol-APPN (SNAP-APPN), and will provide a full set of APPN and LU6.2 functions. It will initially be available only to OEMs, but will be sold directly to end-users later this year.

■ Further Hitch For E-mail Security

It seems some battles just go on forever. After six years of wrangling, the Internet Engineering Task Force (IETF) has finally agreed on a suite of messaging protocols governing the security of e-mail transmissions, clearing the way for the sanctioning of some long-overdue e-mail security standards. The only problem is that the the US government, via the National Institute for Standards and Technology (NIST), is recommending a different approach. The IETF announced recently that it is adopting the privacy enhanced mail (PEM) protocol for use on the Internet. PEM addresses four areas of security: sealing and signing a message; verifying the integrity and signature of a message; encrypting a message to ensure confidentiality; and decrypting a confidential message. Under PEM, the e-mail sender uses a private encryption key to sign a message and the receiver uses a corresponding public key to check the signature. Encryption and decryption require that the sender and receiver have the same private/public key pair. Under this approach, products from California-based RSA Data Security handle the distribution and management of public keys. But NIST is using a different set of encryption algorithms, known as the Digital Signature Standard. Vendors say the government may be out of step with the industry, as many vendors have already committed to building products that use RSA's software, and will build products that comply with PEM.

Router Runs Faster off the Bus

Proteon's CNX 600 uses a memory buffer and scalable architecture to boost performance.

In the hotly competitive high end router market, almost all vendors boost performance the same way — by making the bus go faster. But the bus itself can be a bottleneck, since it imposes an extra layer between interface cards and processors. Proteon doesn't have that problem. Its Corporate Network Exchange 600 (CNX 600) does away with the bus altogether, instead using an innovative combination of buffered memory and scalable architecture to boost throughput.

The CNX 600 is based on one or two 29030 RISC processors from Advanced Micro Devices and offers a fourfold performance boost over Proteon's previous high end router, the CNX 500. Proteon says a CNX 600 equipped with two processors can handle as many as 100,000 packets per second (pps). With one processor, the CNX 600 handles about 50,000 pps, Proteon says.

Like the earlier CNX 500, the CNX 600 uses a design called Packet Buffer Memory in place of a bus architecture. The difference between the two approaches is the way data is handled within the router. Traffic entering the CNX 600 through input/output cards is passed straight to the 2Mbyte Multi-Port Packet Buffer Memory, where it is stored until a routing decision is made (see figure).

The Packet Buffer Memory is connected to the processor (or processors) by a channel that passes information at up to 800Mbps. The processor looks at the packet's header and determines which interface card and port to send the data to. Then the data, which has been sitting in the Packet Buffer Memory, is redirected to the right output port.

A bus architecture, in contrast, requires the router's processors to determine which port can receive data — usually through an interrupt that signals the bus to connect with the appropriate port. Once the data is moved into memory, the processor examines packet headers and determines the exit port to send the data out on. Then the bus is relinked to the port and data moved from memory.

Proteon says its approach is more efficient because it involves fewer steps. Moving data from memory to an interface card is much faster than moving it from memory over a bus to an interface card.

The new CNX 600 has five slots, each of which accepts one interface module for connection to LANs and WANs. On the LAN side, modules are available for Ethernet, Token Ring, and FDDI networks. Notably, these modules are compatible with the earlier CNX 500. The WAN module accepts attachments to four wide area links. Proteon says it will soon ship modules called Quad Cards that each accept up to four attachments. A fully configured CNX 600 will then support up to five FDDI networks, 20 Token Rings operating at 4 or 16Mbps, 20 Ethernets, or 20 wide area connections.

The modules' downward compatibility could be an important factor, since it's a feature not offered by most competitors. For example, interface cards for the high end Cisco 7000 are not interchangeable with those for Cisco's previous high end AGS+.

The CNX 600 uses Proteon's Transportable Software Architecture (TSA) routing software to support all common networking protocols, including AppleTalk, IPX, DECnet, OSI, TCP/IP, Vines, and XNS. TSA also supports router-to-router protocols such as PPP, OSPF, and Proteon's Multicast OSPF. In addition, TSA supports common bridging algorithms such as source route bridging, spanning tree, and adaptive source routing transparent.

The CNX 600 links to X.25 and frame relay networks. Network managers can control wide area bandwidth allocation by using Proteon Internetworking Traffic Management (PITM) software, which assigns priorities and reserves bandwidth based on protocol. For example, PITM can give SNA traffic encapsulated in IP packets priority over other packets that are not as time-sensitive.

PRODUCT SUMMARY

Name: CNX 600

Description: High performance multi-protocol router for data-intensive, central site applications

Price: From $35,000

Vendor: Proteon, 15 Blue Street, North Sydney, NSW 2060. Tel: (02) 955 8555

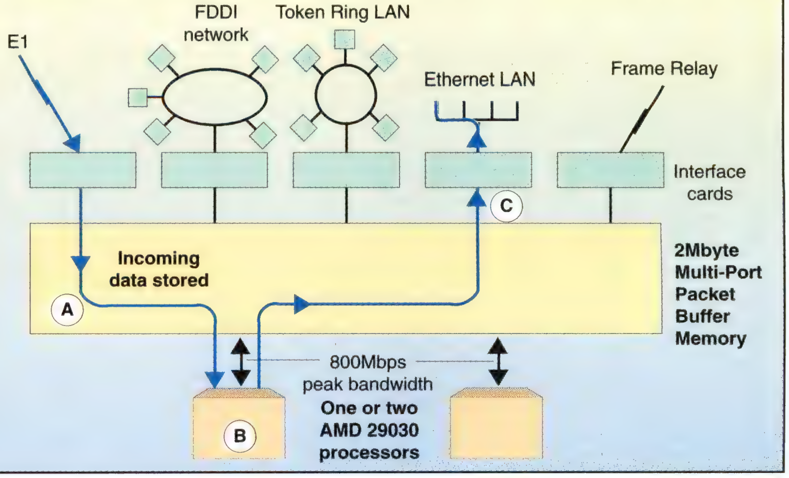
The CNX 600 has features that help maximise uptime; among them, dual power supplies. Proteon says its implementation is the only one that keeps both power supplies on-line. If one power supply fails, the CNX 600 never loses power; it switches to the remaining power supply. Additionally, a faulty power supply can be swapped out without powering down the router.

The CNX 600 also has an Integrated Boot Device (IBD) that uses flash memory for remote and central-site software maintenance and a 3.5-inch floppy drive that gives managers one more way to upgrade software. The other ways are using the IBD over the network, or by dialling into the router through an integral 2.4Kbps modem. The modem also provides access to detailed, out-of-band SNMP network management information. The router can be managed by any SNMP management system.

Salvatore Salamone

A Router for the Central Site

Rather than using a bus, Proteon's CNX 600 stores incoming data in a Packet Buffer Memory (A) until an AMD 29030 processor can examine it and make a routing decision (B). The data is then redirected to the appropriate port and sent out onto the internetwork (C).



Kalpana's Switch in Time

Kalpana has added a new chassis and support for SNMP and FOIRL to its EtherSwitch product line.

Kalpana, via its distributor NetComm Australia, has just announced some changes to its EtherSwitch product line. The original 'B' chassis hub has been replaced by a new 'C' chassis model, a 5 port 10Base-T hub (available with or without SNMP capability) has been introduced, as have new UTP/AUI, FOIRL (Fibre Optic Inter Repeater Link) and SNMP modules for the 'C' chassis. Upgrades for older units are also available. The 15 port unit is now ordered as a chassis and modules as required. NetComm configures the Kalpana units as ordered, and ships only the single unit. The 'C' chassis is a rack mount unit, while the 5 port hub is intended for desktop use.

The EtherSwitch, as its name suggests, is a *switching* hub rather than a simple repeater or concentrator. These devices, which Kalpana has been producing since 1991, are a useful cross between a simple repeater and a bridge in that they are deployed as repeaters, but function on the basis of MAC layer addresses as do bridges. These units provide multiple, parallel paths for network sessions and thus increase the system's available throughput. As well as Kalpana, they are available from several vendors including Alantec, Artel Communications, SynOptics (through a licensing agreement with Kalpana), Fibronics International, Synernetics, and 3Com (through a licensing agreement with Synernetics).

For example, if there are two workstations and two servers on a network connected via a normal repeater any transmission between a workstation and either server prohibits the second workstation or the other server from transmitting data. This happens whether or not the second workstation wants to send data to the same server as the first workstation. If an EtherSwitch is substituted for the repeater the first workstation can hold a data exchange with one server while the other workstation has a concurrent exchange with the second server. If both workstations attempt to access the same server at the same time then the EtherSwitch acts as a repeater.

The same thing happens in the case of a broadcast transmission. The number of parallel paths available is equivalent to half the number of ports on the EtherSwitch. That is two on the five port unit and up to seven on the 15 port device.

A switching hub is not a magical solution to a congested network, nor is it a total replacement for a bridge. Its effect upon network traffic flow is largely dependant upon the network structure into which it is introduced.

Many sites have a single server on one segment of a repeater and workstations on all the others. In most cases, machines are running an older network operating system which is not intended as a peer-to-peer system, and therefore all network sessions are between workstation and server. In such a situation an EtherSwitch will not help, and neither will any other device.

If, however, you have a network with two servers each on a single repeater segment and workstations on all the others, then an EtherSwitch will double your system's available throughput.

Note that *throughput* should not be confused with *bandwidth*. Two servers means a maximum of two concurrent server-workstation data exchanges, each of which has a bandwidth of 10Mbps, and therefore your system (no matter how many ports your EtherSwitch has) has a maximum throughput of 20Mbps.

Peer-to-Peer Potential

Where EtherSwitches can make a tremendous difference to network performance is in peer-to-peer networking. If you are running NetWare Lite, ArtiSoft's LANtastic, Microsoft's Windows for Workgroups or plan to run Windows NT, basing your network on a single drop cable system — i.e. 10Base-T — then switching hubs could potentially provide a significant performance boost at a very attractive price.

I say *potentially* because you would have to be actually using the peer-to-peer capabilities of these NOSs. Most people who run these systems today still configure one machine as a dedicated server. It is still rare to find groups of users who regularly access each other's PCs directly rather than sharing data or applications via a dedicated server. If you are using the peer-to-peer capabilities of a NOS to full effect then the EtherSwitch acts as a network of basic bridges at a much lower price.

For example, a 14 port EtherSwitch will provide seven concurrent data paths at a cost of $28,882. If you wanted to do this with ordinary bridges you would need at least 14 of them, each with fourteen ports. Since most bridges start at around $3,000 the cost would be impossible to justify. On the other hand, the EtherSwitch costs $2,063 per port, five to 10 times the cost of a simple repeater, so if you are not using a peer-to-peer NOS as it was intended and therefore deploy the EtherSwitch as a repeater you are wasting a great deal of money.

As always, good network design gives you greater options and is more cost efficient in the long run.

Another advantage the EtherSwitch has over a repeater is the option of an SNMP agent. This is built in to the ES500S (the ES500 is upgradable) and is provided by a module which occupies one slot in the 'C' model chassis. Kalpana's SNMP agent is MIB II compliant and upgradable since it resides in EPROMs. Kalpana's SNMP agent provides proprietary extensions to the standard MIB and is compatible with SunConnect, Sun NetManager, HP OpenView, SynOptics LattisNet Management and Novell's NMS system. Kalpana's FOIRL is compliant with the proposed IEEE standard.

In summary, the Kalpana EtherSwitch family provides a cost effective alternative to the deployment of multiple bridges in situations where something other than a simple repeater is required to conserve network bandwidth, however, like a bridge, its effectiveness is heavily dependant upon the nature and flow of network traffic. Any attempt to deploy the EtherSwitch — or most other transmission systems equipment — without an solid understanding of your network's traffic will almost inevitably result in a series of expensive mistakes.

Graeme Le Roux

PRODUCT SUMMARY

Name: EtherSwitch

Description: Switching hub for Ethernet networks. Provides multiple parallel paths for network sessions.

Price: (Ex tax) ES500 EtherSwitch 5 Port Hub, $7,890; ES500S EtherSwitch 5 Port Hub with SNMP, $8,768; ES1500 EtherSwitch 15 Port 'C' Chassis, $4,382; ES1500S EtherSwitch 15 Port 'C' Chassis with SNMP, $7,890; ES2001 UTP + AUI Packet Processor, $1,750; ES2002 FOIRL Packet Processor, $2,627; ESUP01 SNMP for 'C' Chassis (requires 1 slot), $3,504; ESUP11 SNMP Upgrade for ES500, $1,311

Vendor: Kalpana Inc.

Distributor: NetComm (Australia),
Block A 25 Paul Street North (PO Box 379), North Ryde NSW 2113.
Tel: (02) 888 5533

Datacraft Opens Up Routing

With its new AP 4000 routers, Datacraft has demonstrated that the best in internetworking technology isn't necessarily imported.

One of the things which complicates the design and implementation of WANs in Australia is that most of the equipment on the market is designed and built in — and for — either the US or Europe. This is a problem because the services provided and the standards used in those countries are not necessarily in use in this country. The expensive result of this is that to connect a heterogeneous LAN/EDP system to a WAN backbone often requires several expensive imported boxes, often in a far-from-standard configuration, and using only a small percentage of the features you paid for.

Datacraft was founded in 1974. In 1978 the company went international with the opening of offices in New Zealand and Hong Kong. Today it has offices in most of the Western Pacific region and sells in Europe via ICL, which named it as Vendor of the Year in 1991, in the category of network solutions provider. Employing 500 people, Datacraft is an Australian-founded, Australian-owned, and Australian-operated company which has been doing international business for longer than most major network vendors have been *in* business. It has just successfully undertaken a major R&D operation and brought to market a new range of wide area bridge/routers, access modules (software allowing the integration of a variety of hosts into a WAN) and management software which is designed with domestic and international markets in mind. Second to none technically, the AP 4000 OpenRouter family combines a feature set and price very difficult to ignore.

At the lower end of the family is the AP 4600, which is intended for use in smaller, remote sites and is capable of supporting up to 12 V.24 ports in either synchronous or asynchronous modes (with the addition of two AP 4601 interface boards), two X.21 or V.35 ports and a single Ethernet port (AP 4640) or a Token Ring port (AP 4660). There is also an interface card (the AP 4602) which permits the connection of up to eight IBM 3270 Control Unit Terminals, and a floppy disk option.

The larger AP 4700, which is intended as a WAN gateway at a central host site, is based on a i486 processor in a motherboard able to support up to four interface cards.

Under test conditions, and using 64-byte frames, Datacraft claims that this unit is capable of filtering and forwarding rates which are high enough to permit the concurrent operation of six Fastpac 2 services and a single Ethernet interface. This performance is undoubtedly one reason why Telecom will be badging these units as the customer end of its Fastpac 2 service.

The third member of the family, which Telecom and QPSX are using to provide the exchange side of the Fastpac network (running 802.6 protocols), is the AP 4100, which can be configured to support V.24 (AP 4101 processor board), V.35, X.21 (AP 4102 processor board which includes an Ethernet port), Ethernet via the AP 4105, Token Ring via the AP 4103 and G.703/4 connections. The G.703/4 interface is provided by the AP 4104 E1 Dual Interface Board. The architecture of the AP 4100 is particularly interesting, as it is a true multiprocessor platform. It has provision for up to five independent processor cards and eight interface adaptors. This approach results in a high degree of configuration flexibility, as is evidenced by the current options available.

Furthermore, it is an extremely neat piece of engineering from the point of view of future development. Since the unit's chassis provides only bus connection to the other processors and interface cards, power supply and access to the unit's floppy controller, there are very few constraints on future processors and interfaces. This means Datacraft is free to respond to market forces, while customers can be certain that the unit will have a long service life and that upgrades will be readily available. The design also makes troubleshooting simple and, perhaps more important, extremely quick.

The AP 4000 family provides comprehensive IP routing capabilities, including a choice of routing algorithms, as well as OSI CLNS and AppleTalk routing. All units can be managed via SNMP by any standard management platform.

Datacraft has also released its own management platform, the OpenManager Network Management System, which can provide remote boot via the BOOTP protocol; and an Extended Management Module specifically for control of AP 4000 family units over a wide area. The OpenManager NMS and AP 4000 EMM also provide CMOT management capability. OpenManager is based on core software licensed from NetLabs in the US and is a completely modular, object oriented system designed to run in a Sun/Motif environment. This code is licensed by several manufactures internationally, and is highly respected.

Datacraft's publicity says the company spends about 15% of its revenues on R&D. With the AP 4000 family and OpenManager software, it appears to have invested every cent of that money very wisely.

Graeme Le Roux

PRODUCT SUMMARY

Name: AP 4000 OpenRouter Family and Access software for IBM SNA, X.25, DEC LAT, Bull, Burroughs, Sperry, ICL, HP and Perkin-Elmer. OpenManager Network Management Software

Description: High performance WAN routers, Access Router software and SNMP/CMOT management software

Price: (Base unit prices only, ex tax; interface/processor boards priced separately) AP 4100 OpenRouter $8,162; AP 4640 OpenRouter — Ethernet $6,665; AP 4660 OpenRouter — Token Ring $8,665; AP 4700 OpenRouter $12,856; OpenManager Network Management System: up to 100 users — $9,740; over 100 users — $22,970; AP 4000 EMM: $14,000

Vendor: Datacraft, PO Box 353, Croydon VIC 3136. Tel: (03) 727 9111

Datacraft's Australian designed and built AP 4000 router family

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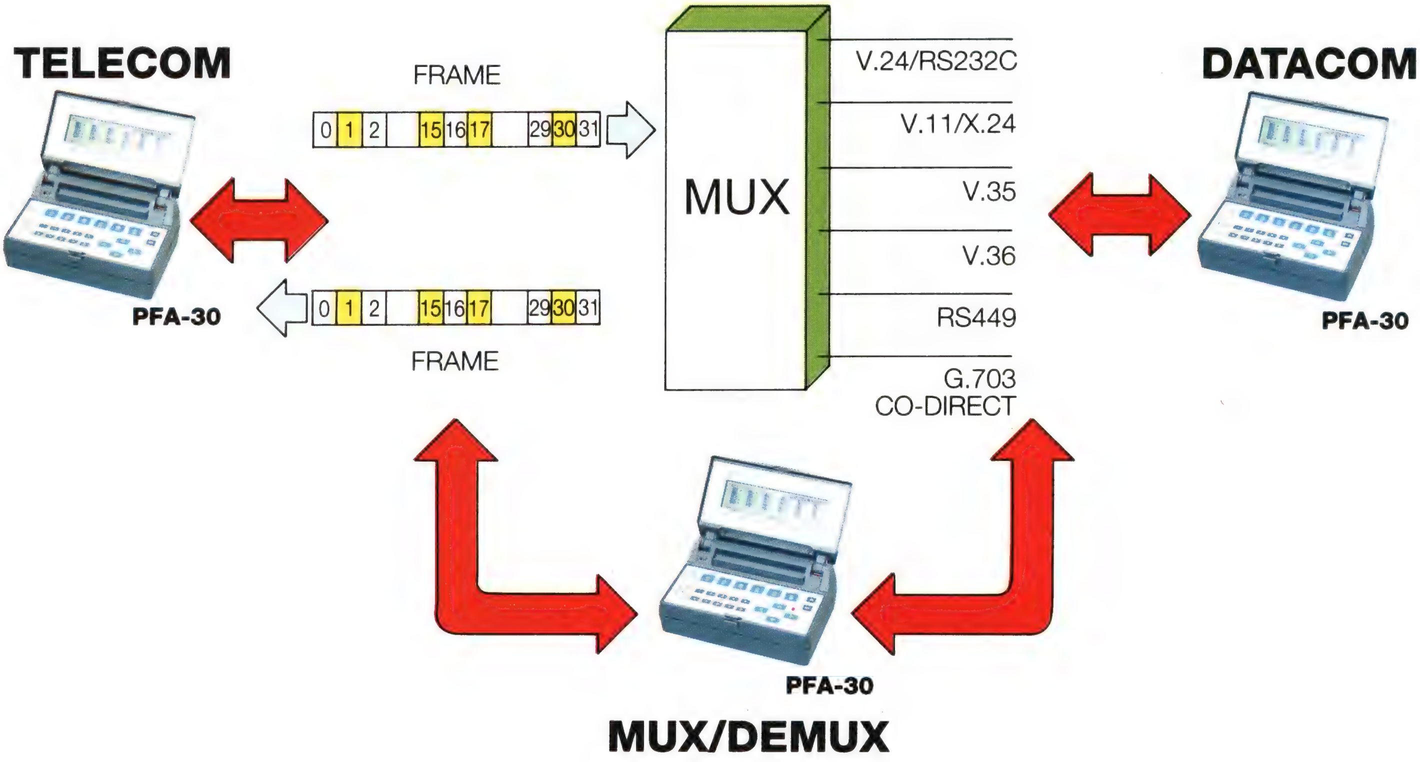

TELECOM/DATACOM TESTING

The increasing variety of interfaces and equipment used in modern voice and data networks creates a need for versatile and comprehensive test equipment. The emphasis is on portability, for field use, together with the ability to test all the interfaces likely to be encountered.

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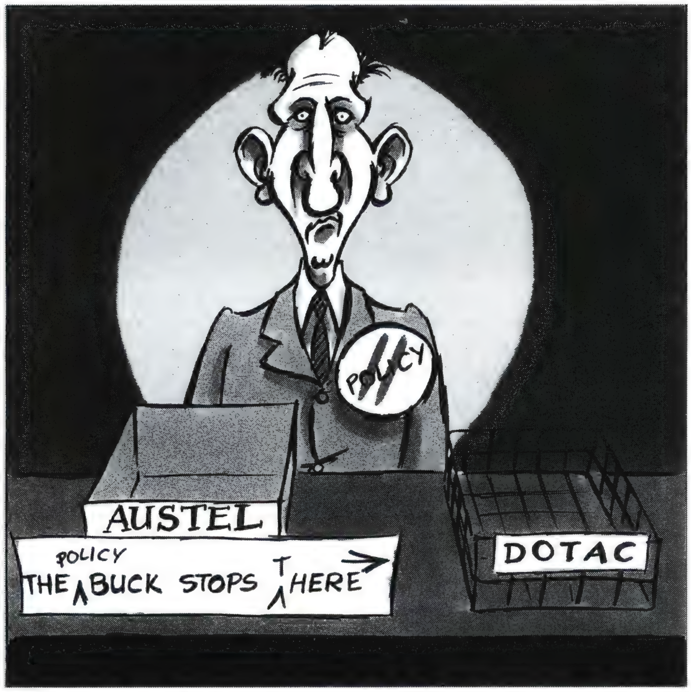
Competing Carriers and Competing Regulators

Austel's performance in fulfilling its pro-competitive mandate has come in for a barrage of criticism over the past few months. Peter Leonard takes a look at the reasons why.

It was inevitable that the exercise of Austel's pro-competition powers would be controversial. However, it wasn't expected that debate would arise over the extent of Austel's powers — and its views as to when it was appropriate to exercise those powers — so early in the duopoly period.


POLICY
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There can be no doubt that this debate is gaining momentum. Firstly, the Government's National Competition Policy Review, chaired by Professor Fred Hilmer, has focused attention on whether industry-specific regulation is appropriate, or whether Austel's competition functions should be transferred to the Trade Practices Commission (TPC). Second, recent Austel decisions have been strongly criticised by, among others, Optus and AAP Telecommunications. This *Legal Line* looks at what all the fuss is about.

Competitive Charter

Unique among Australian regulatory agencies, Austel has the power to give directions to parties regulated by it (that is, the carriers) in performance of its functions of 'promoting competition in the telecommunications industry, within the regulatory framework established by the Parliament' and 'promoting competition among the carriers.' As noted by Austel in its submission to the Hilmer Committee, 'the thrust of the regime to open up the telecommunications industry, namely, the promotion of competition by the orderly dismantling of the incumbent's market dominance, is in contrast to that of the general competition law which is to strike at specified anti-competitive conduct, including the acquisition of market dominance.' Indeed, it is precisely this limited ambit of general competition law which Trade Practices Commission (TPC) Chairman, Allan Fels, now seeks to expand by proposed inclusion of a new part in the *Trade Practices Act* which would give the TPC an Austel-like role in creating competitive markets.

That said, Austel has consistently taken a narrow view of its pro-competitive charter. For a start, Austel Chairman, Robin Davey, has stated Austel's role as 'to implement policy decisions made by Government — not to make policy.' Austel has been reticent to itself construe policy by reference to the objects and purposes expressed in the Act. It has frequently sought and relied upon advice from DOTAC as to Government policy. This advice has sometimes taken the form of letters from the Minister or DOTAC stating how the *Telecommunications Act* is to be interpreted. Not infrequently, these interpretations sit somewhat uncomfortably with statements in the Explanatory Memorandum, which accompanied the Act and was intended to be an aid to its interpretation, or with what would appear to be a reasonable reading of words used in the Act on their face value.

Austel's conservative approach is also consistent with Robin Davey's view of Austel as a 'facilitator,' rather than a 'regulator.' Austel has avoided confrontational exercise of its power. Instead, it has generally proceeded from private discussions and consideration of written submissions, and has followed with endeavours to mediate outcomes which are acceptable to the parties concerned.

The power to issue directions to carriers has been kept in reserve as a lever to secure outcomes which Austel considers appropriate, or exercised sparingly to facilitate the collection of information which would assist Austel in monitoring carrier activities.

Austel's consultative mode of operation has lead to complaints that its approach favours a party taking intransigent or extreme positions in order to cause the middle ground to tilt in their favour. Austel no doubt considers this criticism ill-founded, and takes the opinion that it is well able to objectively assess parties' positions and to determine an outcome which pays due regard to the public interest and the interests of consumers. Whether this is correct or not, a number of parties, including Optus and AAP Telecommunications, have criticised the time Austel takes to make decisions (which is of course partly a result of its consultative approach), and have also complained that decisions are generally not supported by as detailed reasoning as the submissions made to Austel to assist it in forming its conclusions.

General Competition Law

Austel has also narrowly constructed its charter to promote competition by reference to general competition law concepts. This approach has, perhaps not surprisingly, been championed by Telecom, which, in its submission to the Hilmer Committee, asserted that 'a separate body of telecommunications-specific competition policy law should not be allowed to arise where the conceptual bases exist in general competition law.' Telecom continued that 'the principles underpinning the competition policy provisions of the *Telecommunications Act* should be applied in a manner consistent with general competition policy practice as it develops.' Of course, the difficulty with this approach is identified by Austel in its submission to the Hilmer Committee. To restate the difficulty as it is expressed in DOTAC's submission to the Hilmer Committee, 'the TPA is fundamentally unbalanced' as it targets conduct that contributes towards a lessening of competition, and does not adequately address situations where competition is emerging or where new markets are developed.

Austel's approach has implications far beyond inter-carrier regulation. For example, Austel's investigation into alleged cross-subsidisation by Telecom in the telemarketing, electronic data interchange (EDI) and paging sectors utilises predatory pricing concepts. Austel assesses whether cross-subsidy leads to a lessening to competition by applying traditional competition law analysis. Cross-subsidy and utilisation of other advantages accruing to Telecom over its competitors by virtue of its entrenched market position and its horizontal and vertical integration is not seen, of itself, as sufficient to warrant Austel intervention. Rather, the cross-subsidy must be sufficiently substantial as to constitute predatory pricing (essentially, below cost pricing). Further, there must be a lessening of competition in the relevant sector, as distinct from damage to a competitor.

For example, in the telemarketing study Austel determined that AOTC's pricing of its telemarketing services was damaging to competition, but referred to the TPC investigation of damage to competitors in the industry. By contrast, in the EDI industry study Austel determined that although there was significant cross-subsidy to warrant referral to the TPC of allegations to individual competitors, it did not appear that Telecom's market conduct had resulted in any noticeable damage to competition in the EDI industry.

Damage to Competition

The difficulty with this approach is that any equation of 'damage to competition' and 'lessening competition' implies that unless there is such manifest damage to existing competitors as to undermine continuing competition in a sector, Austel will not be minded to intervene. This is at variance with at least one interpretation of Austel's charter of 'promoting competition.'

This approach also sits oddly with the Government's expressed policy position on preselection and equal access. That policy has been expressed by the Minister as that preselection should be given the widest practicable interpretation and application consistent with the specific statutory provisions, and that, consistent with this approach, the preselection ballot should 'be as wide as practicable in its coverage.' As noted by the Minister, wide coverage of all practicable categories of services was necessary to ensure 'that there is no scope for market power at the local exchange level to be used to adversely affect competition in other parts of the network.' In other words, the policy object of promoting competition through preselection and equal access was to be construed by reference to the goal of promoting competition and consumer benefit, and not by reference to narrower trade practices concepts of whether a refusal by Telecom to provide equal access would lessen competition in a relevant market.

Similar policy issues also arose in Austel's administration of the inter-carrier retail pricing and discrimination rules. In effect, Austel concluded that pricing activity by a dominant carrier which falls short of an abuse of market power, taking the general competition law concept of predatory pricing, would not be sufficient to warrant intervention, so long as explicit pricing rules were complied with.

The SPA/Flexiplan Dispute

The current Telecom/Optus dispute over Telecom's Strategic Partnership Arrangements (SPAs) and Flexiplans illustrates this issue.

Austel itself noted (in its submission to the Hilmer Committee) that in some segments of the telecommunications industry 'a fully competitive environment may not develop in the foreseeable future — that is, Telecom is likely to retain a bottleneck power over the customer access network or local loop for many years.'

Optus argued that if Optus' inability to compete in local service and in relation to a substantial proportion of the long distance market (that is, outside areas with interim dial code access or preselection) is factored into calculations, the effective rate of discount required for Optus to compete in relation to services on which it currently competes with Telecom must be substantially higher than Telecom's nominal discount under the SPAs and Flexiplans in relation to these services. This advantage accrued to Telecom as the monopoly incumbent provider of the local loop and other non-competitive services, which it can factor in to increase the base on which discounts were offered.

Telecom's response (in submissions to Austel) was that the pricing did not have the purpose, or would not be likely to have the effect, of substantially lessening competition in a relevant market (the Trade Practices test), and was in any event permitted under the pricing rules to enable Telecom 'to meet competition and to respond to the market.' In effect, Telecom asserts (and Austel apparently agrees) that because Part 9 of the Act applies particular rules to carrier retail pricing, then provided those rules are complied with, Austel should not intervene unless the pricing contravenes the *Trade Practices Act.*

This approach places particular importance on the precise meaning and effect of those pricing rules, which are now the subject of Federal Court litigation between Optus and Telecom. As this litigation is pending, and as the writer acts for one of the parties (Optus), it would be inappropriate to comment on the merits of this case. Instead, I will briefly background the dispute.

Austel's Policy Principles

The litigation followed months of discussions between Austel, Telecom and Optus over the scope of Telecom's Strategic Partnership Arrangements (SPAs) and Flexiplan filings. These discussions concluded with Austel's 15 February 1993 release of 'Discretionary Charging Options — Anti-Discrimination and Competition Policy Principles.' Austel interpreted the pricing rules in Section 183 and 185 of the Act as permitting both cost-based and non-cost-based charging options. Austel relied upon advice from the Commonwealth Attorney-General, apparently to the effect that Section 185 of the Act, which is often interpreted to only permit cost-related differentiation in prices charged by a dominant carrier to customers, allowed non-cost-based differentiation in packaging of charging options such as Flexiplans, where these were 'a reasonable arrangement having regard to accepted commercial considerations and [the packaging's] object or likely effect does not entrench or further market dominance by a carrier.'

Austel announced that it intended to disallow a non-cost-based charging option 'if it includes features that Austel concludes are likely to have a net anti-competitive effect.' It gave as examples of features likely to have such an effect the combining or 'bundling' of local calls and/or mobile-originated calls with other types of service, and cumulative discounts achieved by combining separate charging options or combining a non-cost-based option with a cost-based option. However, as Austel was of the view that Telecom's SPAs were cost-based, these were not subject to the 'net anti-competitive effect' test. This means that Austel will permit the inclusion of non-competitive services like local calls, connections and leased lines in the bundle of services to which SPA discounts are applied.

The current litigation therefore focuses on two issues. Are the relevant charging options cost-based? To the extent that they are not (for example, Flexiplans), do the pricing rules permit non-cost-based price differentiation and if so, subject to what limitations? Of course, these rules only apply if Telecom remains 'dominant,' as discussed by Peter Waters in the February 1993 *Legal Line.*

It is curious that the end result of this process has been to import a 'damage to competition' test into the pricing provisions. In effect,

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this interpretation of Section 185 adds a 'meeting competition' justification for price differentiation similar to that employed in Section 49 of the *Trade Practices Act*. The Explanatory Memorandum to the *Telecommunications Act* noted that Sections 183 and 185 of the Act differed from the TPA provisions 'by focusing on the relationship of a carrier to a particular market (ie. dominance in a market) rather than the possible effects of the discrimination on the market.' It will be for the court to determine the appropriate interpretation.

0015 Arbitration

Austel's recent 0015 arbitration illustrates the importance of Austel's characterisation of policy in determining the outcome of an inter-carrier interconnection dispute.

Neither the Act nor the carrier licences specify which particular services or types of services are to be 'preselectable.' Telecom and Optus were unable to agree whether 0015 code-accessed facsimile 'services,' including Telecom's current offering, should be included in the preselection package to be submitted to the initial ballot. Austel determined that the Telecom offering should not be subject to preselection, that Telecom will retain the 0015 code, and that Optus will be allocated another 00XX code.

Austel considered that there were three factors which should be taken into account in assessing inter-carrier service access options. First, the policy of 'equal access,' which Austel interpreted as 'equality of opportunity to supply services to all customers as reflected in the competitiveness of the market and the extent and ease of customer choice.' Austel said that equal access 'is concerned with removing barriers to market entry and competition that result from the misuse of market power by carriers in relation to access to essential facilities or access to customers.'

Second, options should be assessed to determine whether they promote carrier infrastructure investment and provide an incentive for carriers to innovate and develop differentiated product offerings. Third, account should be taken of the 'user friendliness' of service access and use, in order to maximise customer convenience and minimise customer confusion.

Few would disagree that these three criteria are reasonable. However, the weighting accorded to each of these criteria will, of course, be critical to the outcome of any analysis. Austel appears to have placed considerable weight upon confidential submissions by Telecom as to 'significant proposed changes to its current 0015 service' that allegedly would render the service substantially different to the voice services included in the agreed 'package' of preselectable services. Austel considered that the disadvantage to the customer of multiple codes was outweighed by the importance of promoting carrier competition.

Austel's characterisation of 'equal access' is particularly interesting. ATUG and SETEL (Small Enterprise Telecommunications Centre) in their submissions noted the importance of equal access in removing obstacles to customers having convenient access to carriers, particularly for now-basic applications such as fax. Austel appears to see equal access principally as an intercarrier issue, requiring consideration of whether denial of access would constitute a misuse of market power, rather than in the context of promoting convenience of customer user of carrier services and 'transparency' in customer network access through simple and non-carrier-specific access codes. In short, if the concept of 'equal access' was construed from a consumer-oriented perspective, rather than from the viewpoint of preventing misuse of market power by a carrier, a quite different result may have been reached by Austel.

The Way Forward

Austel has clearly seen its charter as limited to identifying carrier practices which are 'damaging to competition,' rather than damaging to another carrier. Austel's assessments of what is, or is not, 'damaging to competition' are likely to continue to be the subject of considerable controversy, particularly as such assessments are based upon normative analyses. This interpretation has also meant that issues which parties may have expected would be finally dealt with by Austel, such as allegations of unfair conduct damaging market participants, have been referred to DOTAC for policy guidance, or passed on to the TPC for its assessment of whether the relevant conduct breached any provision of the *Trade Practices Act*. This of course ensures that, in the words of Telecom's submission to the Hilmer Committee, the competition policy provisions of the *Telecommunications Act* are 'applied in the manner consistent with general competition policy practice.'

However, the adequacy or otherwise of applying that practice in the telecommunications industry, and Austel's interpretation of its limited role, are likely to remain hotly contested issues for the foreseeable future.

Peter Leonard is a partner with the Sydney technology law firm, Gilbert & Tobin, and specialises in telecommunications and information technology contracting and regulation. This column sets out his views and not those of clients of his firm.

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A Word of Advice on the Dangers of Deregulation

Clem Doherty

Director, McKinsey and Company

Clem Doherty is a Director of the Australian office of McKinsey and Company and a leader of the Asia Pacific Telecommunications, Media and Electronics Industry Practice, which has staff in Tokyo, Sydney, Melbourne, Osaka, Seoul, Taipei, Hong Kong, Bombay and Delhi. He performs a number of other roles within the international management consultancy firm as a member of the Global Research and Professional Development Committee and the Asia Pacific Council. He holds a BSc and BE (Elec) from the University of New South Wales and an MBA from Stanford University. While McKinsey and Company was celebrating its 30th anniversary in Australia last month he spoke with Liz Fell.

Your Asia Pacific Telecoms team held a conference in Tokyo recently. What issues were highlighted there?

Doherty: Just about every telecommunications company around the world is facing some form of increased competition and either partial or full deregulation by the turn of the century and they are starting to think about how to respond. So one issue was the shape of the organisation, not just the structure, but the customer focus and so on.

Telecom Australia which, as far as I'm aware, was the first to take a business unit approach towards customer focus, has become one model which is being assessed in great depth by European and Asian companies. And what goes along with this, of course, is the massive productivity gains that need to be achieved for competitive success, particularly versus new entrants coming in on the back of a pro-competitive policy.

AC: *Is it correct to say that much of McKinsey's telecoms expertise in Australia comes from working with Telecom?*

Doherty: Some of us started off working in the US in the days when telecommunications was deregulating, so we bought some expertise with us. Others were working in Europe, particularly in the UK, and Japan at the early stages of privatisation and deregulation.

But when you look at this region relative to other parts of the world, it's pretty well at the forefront in terms of change. Australia, New Zealand and Japan have three industry structures which are a fair way down the track, whereas people only talked about the US having a deregulated position ten years ago. In relation to working with Telecom, we don't disclose our clients.

AC: *But the fact that you have worked for Telecom since the early 1980s is well known.*

Doherty: I think it's true to say that Telecom has disclosed that on occasions during the past five to ten years.

AC: *In the US, is it correct that McKinsey works with AT&T?*

Doherty: Again, we don't disclose.

AC: *Returning to Telecom, you've worked on projects related to customer focus, divisionalisation and the new industry structure among others.*

Doherty: Telecom has acknowledged that we helped them think through changes towards a more customer-focused organisation in 1987-88, in advance of the new industry structure.

AC: *Did you regard that exercise with Telecom as a success?*

Doherty: The unique thing was that Telecom Australia actually took moves organisationally to orientate itself towards the customer before the advent of extensive network competition.

AC: *But surely most people would agree that even now, when Telecom is competing with Optus, it is still struggling with a customer focus?*

Doherty: If you look at companies around the world, particularly those supplying the local loop to customers, their service generally is less than what customers require.

But most people would acknowledge a substantial improvement in Telecom Australia's performance since 1988. At that time, there was great deal of hoop-la about the number of working pay phones and this has improved. That's just one example, and, of course, its structure has changed several times since.

AC: *Do you know of any local telcos round the world with exemplary performance?*

Doherty: Not really, but I think higher standards of customer satisfaction generally occur in America with the Regional Bell Operating Companies. In Britain, Mercury was providing a high grade service in its first few years in the City of London. But BT has made a substantial improvement over the last few years, so it would be interesting to see its customer satisfaction ratings today versus five years ago.

The interesting thing about this industry is that most of new competitors are long-distance carriers. They're not providing end-to-end service on a wide-scale basis to residential customers.

AC: *You said that Australia, Japan and New Zealand were at the forefront of deregulation around the world. What are the major challenges for countries planning to introduce competition?*

Doherty: One is to establish a structure that is not artificial and another is to establish an environment which doesn't confer too many windfall gains. If you decide to move from monopoly to a more competitive environment, the ultimate outcome is to achieve benefits in overall industry effectiveness in terms of servicing customers, and to transfer these benefits through to the economy.

One way to achieve this is for companies to enter at any part of the market. I personally don't like the notion of trying to artificially divide up companies into local, international and long-distance. These are artificial constraints, technology choices. The boundaries are so grey and the technology is moving so fast that you can get the line drawn right for this year, but it's out of date within three years.

AC: *Which country's structures are you thinking of in terms of artificial constraints?*
Doherty: In Australia, the 1988 review separated basic from value added services, but it was a very hard line to hold.

In Japan, NTT [Nippon Telegraph and Telephone] is allowed to be a local and long-distance domestic carrier only, even though it can participate in international business. New entrants are allowed into the international carriage segment, the long-distance carriage segment or the local carriage segment only, which effectively constrains them to a lot of contracting arrangements between players in each segment.

AC: *Do you regard a regulatory structure that tilts the playing field in favour of new entrants as artificial?*
Doherty: Totally. One of the big issues in establishing a competitive regime is to get the right competitive and interconnect arrangements between the incumbent and new entrant. If you tip the field too far, you destroy the value of the incumbent, and if the incumbent is publicly owned, it's very hard to measure how much value was lost.

AC: *Was that the case with NTT after competition?*
Doherty: Yes, that is interesting because NTT was partially privatised in the early industry deregulation period. As the deregulation proceeded and the share price continued to drop below the index, you could measure how much value the market thought was being wiped off.

AC: *Can you measure the value of Telstra?*
Doherty: No, because there's no market. In fact, the policy of retaining Telecom/OTC in 100% government ownership all the way through the deregulation process has not enabled us to see how big a decline in value has actually emerged.

AC: *But that hasn't stopped many valuations ranging from $12 billion to $25 billion!*
Doherty: And why did they range that far? Because there were tremendous uncertainties regarding the value. You've got an unnegotiated commercial interconnect, a ballot coming up for who is going to be the primary carrier, and no-one knows what the churn will be. Once a person signs up for a carrier, will they switch? When you add those uncertainties to the normal uncertainties of introducing competition to the market, you can have wide assumptions and differences.

AC: *Were you in favour of the duopoly structure as a transition towards an open market in 1997?*
Doherty: People tend to compare the Australian situation with the UK, but we actually have a much more aggressive outcome. In the UK, resellers were effectively banned, so there have been virtually no resellers until this year. We're going full-hog. We have a duopoly plus resellers, three mobiles, and other players can line up in various parts of the business. It's actually more competitive than a duopoly and moving much faster than elsewhere.

AC: *It's interesting that so many potential global players have entered Australia as resellers/service providers.*
Doherty: Yes, this is one of the few countries where they can enter the resale market, and there are no reciprocal arrangements for Australian companies. This is where Australia is so different from the UK. If you're going to do anything in 1997 in Australia, you'd want to start building your customer base as a reseller now. So when there's a few dollars up for grabs, why not go for it?

> *"If you look at the price Optus pays for access to the Telecom network, and the access arrangements for customers to use Optus, including a ballot so early in the competitive regime — it's like two 50 yard free kicks in a row. It's the best access arrangement in the world."*

AC: *Why doesn't Australia have reciprocity in relation to resellers? Didn't the Government have enough bargaining power?*
Doherty: I would have thought we had enough bargaining power with the second licence up for grabs under the conditions it was let for. If you look at the price Optus pays for access to the Telecom network, and the access arrangements for customers to use Optus, including a ballot so early in the competitive regime — it's like two 50 yard free kicks in a row. It's the best access arrangement in the world.

AC: *How would you compare Austel as an 'independent' regulator with Oftel in the UK?*
Doherty: From my observations, and talking to colleagues in the UK, it seems that Oftel has a longer leash than Austel. But I'm still not clear on the exact arrangements between Austel and the Ministry. I think it would be a brave person who said they knew exactly how that interconnection worked!

AC: *What's the case in Japan? What role does the Ministry of Posts and Telecoms [MPT] play?*
Doherty: It's quite interesting. The Ministry still approves NTT's prices and it decided on the interconnect regime. But the MOF [Ministry of Finance] is effectively the shareholder of NTT on behalf the Government, so the ownership issue has been separated from the policy.

There must be some pretty interesting debates about various deregulatory moves, with MITI [Ministry of International Trade and Industry] possibly arguing for more deregulation and the benefits for the broader economy and MOF saying that this is coming out of our share price. And then there's the MPT!

AC: *And New Zealand. How do you view that situation?*
Doherty: In the introductory stages of these substantial industry restructures, I think that there's a need for an industry regulator rather than blocking up the courts. I don't sense a lot of these new entrants lining up in New Zealand.

AC: *Do you agree with the idea of a general competition body in Australia?*
Doherty: The main argument against an industry-specific regulator is that they get captured by the industry. That's been the economists' theory for the past 20 years. Just from my observations, I haven't seen Austel captured yet. In a sense, it has probably made everyone unhappy at various stages, but they're regulating policy set in Canberra. You'd have to make a pretty good argument as to why, in the Australian situation, Austel has failed. Rather than just bringing some theory, it's a matter of showing the benefits of an alternative structure, putting some numbers around the benefits.

AC: *What about the labour savings argument?*
Doherty: Look at the North American situation. It has the Federal Communications Commission, which is an industry-specific industry national regulator, plus 50 general regulators, the Public Utility Commissions in each state.

I would doubt, if you multiplied Austel's staff by 50, they would be in a bull's roar of the number of people doing regulatory work in the US. And that means direct employees, not lawyers under contract!

AC: *Did McKinsey's Tokyo conference address trends in the international sector and globalisation?*
Doherty: One issue was the future shape of the international industry and the question of whether there will be a few or many full-line carriers — whether you need the Citibanks of the global industry — and which industry telecommunications might follow in terms of its global form.

AC: *Which industry could it follow?*
Doherty: There are a number when you look at it as an interconnected network: finance, airlines or transportation. There are plenty of lessons from outside the industry,

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so in Tokyo we had our experts from other sectors giving briefings so that we didn't just get into telco talk.

AC: *Do you foresee a few major global players and lots of small domestic companies?*
Doherty: There are a couple of trends. Firstly, there will be a number of carriers that will truly be able to provide global services and follow the major multinationals around the world. They may not own and operate everything, but they'll provide the one-stop-shop end of the market. At the other end, I think there'll be companies that exit the high corporate end and largely become distributors. In the middle, there'll be carriers that, if they want to stay at the high end of the market, will form alliance arrangements with other carriers to enable them systems-wise to provide that end-to-end capability to take on some of the larger players, and there'll be some that choose not to do that.

I think the real strategic choice for companies around the world is not whether they are to be global players at the top of the market. That's really a choice for a few. It's whether they are going to participate heavily in the broadband arena or largely end up as mobile companies. Some companies will end up like telco railways, that is, carriers of last resort.

AC: *Is that broadband/radio split an either/or choice?*
Doherty: It could be one or the other or both. The trick is that they require very different skill sets, so companies are going to have to think carefully about what skills they've got, or can develop, and what may be the winning combination for the 21st century.

AC: *So Vodafone, for instance, has focused on mobile?*
Doherty: Right. Some companies have put their bets down already. And BellSouth's international investments, other than the Optus play in Australia, appear to be directed to the mobile area.

AC: *How do you see the broadband infrastructure developing here compared with other countries?*
Doherty: You've got a regulatory situation in the US that currently forces telephone and cable TV companies to put separate lines down each side of the street. In the UK, the regulatory regime enables telephone companies to put their lines down the street but cable TV companies can put their lines in with telephone lines, although British Telecom is not allowed to enter Pay TV.

Now I don't think we can afford to be as stupid as either of those regulatory regimes. Because of the size of Australia, it would be ludicrous for us to encourage dual provision of infrastructure down the street. It's like forcing two airports on Melbourne just for competition reasons.

AC: *What about the Prime Minister's optical fibre project?*
Doherty: I think that careful consideration should be given to the regulatory regime in the local loop because that's where most of Telecom's assets are invested. Moving precipitously on to some new model could strand millions of dollars of assets. And because of Australia being so large and having to be very smart on infrastructure investment, I think that would need to be thought through very carefully rather than use the first model that came to town.

AC: *Where should Telstra focus investment?*
Doherty: While Telecom is fixed in an uncommercial interconnect regime, investment equations can look very different. If competition really starts to bite in Australia, it's clearly going to be short of cash. Competition is not going to enter the loss-making parts of the business: It's only going to enter where it can make a dollar.

If there is a commercial interconnect regime and it does well in the ballot, then it should have a positive future. Otherwise, Telstra will find it increasingly difficult to participate either in radio or in broadband with the investment levels required to be competitive in this industry.

> *"You can't have a situation where new entrants have a sustainable competitive advantage over the incumbent and then expect the incumbent to do business around the Asia Pacific."*

AC: *What about offshore investment? Will Telstra have enough cash to succeed in the Asia Pacific region?*
Doherty: In terms of getting into the international arena, it should try to get there sooner rather than later while it has some cash to enter those offshore markets and prior to others getting on top of the opportunities. But you can't program the business opportunities in the region to meet a particular timetable.

AC: *With competition beginning to hurt, is it too late?*
Doherty: No. It can buy some more time by growing the business here and by further cost reduction. There's clear evidence from other competitive markets that the business actually increases with innovative pricing — two-tier pricing, packages and so on. But international opportunities are only going to be sustainable when things are put on a commercial basis in Australia. You can't have a situation where new entrants have a sustainable competitive advantage over the incumbent and then expect the incumbent to do business around the Asia Pacific.

AC: *Can the industry — both goods and services — meet the multi-billion dollar export goals the Government has projected?*
Doherty: I think people have confused this export issue from Day One of the telecommunications debate. Let me give a couple of examples of how it really impacts our balance of payments.

Firstly, people have mixed up exports with international sales. Take the example of an Australian telecommunications company that invests in Thailand, runs an operation on the ground, and meets dividends if it figures that's what it should do. So the only 'inbound' cash from the company is some sort of dividend stream. And if, for example, people make more international phone calls from Australia, we actually have to import 'tails' from other countries to complete those calls. People used to ask me why AT&T had advertisements in the *Financial Review*? One reason was to encourage people to deliver 'inbound' services to the US. One way to get exports for Australia is for overseas people to make more phone calls to Australia because we're actually exporting our completed ends. The second order of things can be illustrated by Optus or Telstra doing business in Thailand using Australian suppliers for fibre optics or switches. That would be genuine exports from Australia. Whether they're going to get to $2 billion in that area, I wouldn't like to guess.

AC: *What other areas of the industry were highlighted at your Tokyo conference?*
Doherty: The third issue, and it's an important one, is how competition is conducted. How do companies actually behave when they are not used to competition? We've found companies in a number of countries that have made big mistakes, particularly in pricing. One area where it can be a problem is when incumbents, trying to price against new entrants, open up arbitrage opportunities for resellers. They create too big an opportunity for resellers while their eye is focused too narrowly on one competitor.

AC: *If you were asked to advise the Keating Government on the best strategy to secure Australia's telecommunications future in the region, what would you say?*
Doherty: I'd make sure Australia had the best possible telecommunications connections with all Asian countries. Why? It's in our interest to help countries such as Thailand with their infrastructure and then interconnect them to Australia so we can do business there. People outside the region would then view Australia as a place from where they could do serious business in Asia.

Liz Fell is a freelance journalist based in Melbourne.

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Future Sources

The recent entry into the telecommunications marketplace of independent network managers underlines the shift over the last year towards more off-balance-sheet telecommunications management. In some ways the provision of telecommunications services and the application of communications management have come full circle, with the economics of service provision and management moving back towards the use of on-demand virtual services and external management.

In times gone by, the art of telecommunications management, the network investment and the impact upon a business or organisation were all controlled in-house with services purchased on a needs/requirement basis. Network management, the province of the senior communications/IT staff, consisted of the black art of matching the organisation's perceived evolving needs with best guesses of what might evolve on the supply side. Tariffs determined the annual basket of services mix more than anything else, and the black art was choosing the trend lines.

Under this industry structure a large number of real and virtual private networks were constructed — and in most cases still exist — to provide the historic optimum cost/price performance to match the corporate telecommunications needs.

But change has rapidly been taken up in the industry. Once communications managers had convinced senior management that telecommunications was transparent and price was important, they automatically created the basis for the next change — the change that questions the value or art of having an in-house resource when it is potentially cheaper to go outside. The same arguments used to select the lowest effective communications solutions in the past are now being applied to those who once chose the suppliers. The telecommunications aggregators are being aggregated themselves! — outsourced to specialised companies who contract to do it better and cheaper than having a dedicated resource.

As the mainline business management has felt the need to re-size to match the lower economic activity, the pressure on capital has become more intensive. A back-to-basics approach or a focus on core business activity has meant that non-core activities such as telecommunications are almost always a poor second when the total business is considered.

Once a management recognises its primary focus, it is very difficult to refocus the now scarce resources onto less pressing but potentially beneficial telecommunications projects, causing a spiral of reduced demand and capital reduction.

Outsourcing allows the replacement of internal capital and services with external ones that either provide access to a greater economy of scale, more flexible bandwidth services or better aggregate management or billing. At least that's the theory, but in most cases there are many shades of grey, and although the lure of outsourcing savings can be seductive to management, the real savings can be artificial when set against the actual corporate telecommunications needs.

This new economic focus has coincided with the desire of the carriers worldwide to invest further in the periphery of the infrastructure networks and capture opportunities presented by early market players that wish to aggregate disparate telecommunications services to achieve an economy of scale. This is the edge that outsourcing offers when viewed as a part or whole of the communications effort. Thus the success of the internal management in releasing telecommunications funding has provided the very tool that the management can understand to further save costs.

Those that stand ready to absorb the capital costs, guarantee services and service level objectives plus the myriad of other performance requirements are those best positioned to deliver the new brand of telecommunications management. Exit the Communications Manager, and enter the public carriers and specialist managers. The public carriers are, with very few exceptions, now major financial institutions who have a historical role to provide and fund the installation of communications services. Participating in outsourcing or buying back the farm is one way a carrier may expand the marginal utilisation of the current infrastructure, unlocking the low value of just providing bandwidth and connectivity by expanding the periphery of the network to encompass the particular corporate application.

The economies of migrating from dedicated to virtual increase as the net widens. After all, the bandwidth used to provide most corporate telecommunications facilities is already exclusively provided by the carrier — it is a logical extension to increase the value added components or have low entry costs.

Outsourcing has, apart from the bandwidth, another aspect — the provision and management of user services. These range from the simple telephone to the aggregated bill, and this area has a number of organisations, both carrier-derived and independent, prepared to enter arrangements with the user to organise and manage the total provision of services.

In a world where network management advances are paralleled by even more network services and innovation, users are rushing into outsourcing without the methods to continue to measure the results against both the past and the industry best practice at large, and it's likely the whole exercise will actually lead to higher costs rather than lower ones. The speed of tariff change alone will ensure that outsourcing without control will probably be more expensive in the long term. A full circle migration to switched services can easily be perpetrated under the outsource banner.

Outsourcing is an evolving option for many companies but it needs to be carefully tempered with the a clear view of the future, otherwise a false understanding of true cost-related service pricing and the corporate services benchmark may result in a poorer service/price performance. It is all a question of balance!

Tom Amos is a partner with telecommunications consulting engineers Amos Aked Swift.

Dr Chris Beare

Fibre-to-the-Home — Who Pays?

Discussions are beginning within Government departments on an Australian National Optical Fibre Network Project, an infrastructure initiative initially raised by Prime Minister Keating during the run up to the election.

Government involvement in this area is not new. The Japanese Government's Ministry of Posts and Telecommunications (MPT) in recent months has been examining proposals for local councils and corporations to fund optical fibre networks in Japan. This seems to have arisen due to NTT's reluctance to proceed with its ambitious plan to provide fibre to all Japanese homes by the year 2015. Given the estimated cost of some $380 billion and the increasing competitive pressures on NTT's profits, this is not surprising.

Ambitious programs in the US and Europe are similarly being discussed, although with more emphasis on an information infrastructure than fibre-to-the-home (FTTH). In the US, President Clinton is in the process of seeking funding for his initiatives whilst in Europe, delays with the Maastricht Treaty are holding up significant plans for an European information infrastructure.

In the US, there are other forces at work. The RBOCs are now progressively being freed to provide other services, and are joining battle with cable TV operators to capture the future highway to the home. Pacific Bell has plans to connect all Californian homes on a broadband network by the year 2015, US West has foreshadowed a video-on-demand network, and Bell Atlantic is trialling residential video services. Tele-Communications Inc., a major US cable TV operator, is embarking on a $US2 billion optical fibre upgrade in more than 250 communities by the end of 1996. A similar battle between the cable operators and the telcos is occurring in the UK.

The fundamental but often buried question in all of the talk of FTTH is the one of market demand. Whilst most people will agree that interactive video and video-on-demand services (sometimes called 'video dial tone') will have significant future roles, it is certainly not clear whether the prices that users will be prepared to pay will be sufficient to give a return on the massive capital outlay needed for a national FTTH network.

It is also not clear that fibre is the appropriate technology all the way to the home. Rapid advances are being made in the use of existing copper cables for carriage of video services. With digital compression standards now stabilising (MPEG 2), and technologies such as asynchronous digital subscriber line (ADSL) for one way video, and high-bit-rate digital subscriber line (HDSL) for two way video now being developed, the massive cost of a fibre rewire may be able to be avoided or postponed. It is also only video and not information services that require this extra bandwidth.

In Australia, Telecom has all major cities fibre connected, and fibre routes run out to major metropolitan areas. This is, however, a long way from saying fibre is at the curb or the home. Telecom has some trials in this area, but no widespread commercial plans. It, like its overseas counterparts, is looking for a revenue stream capable of funding the capital expenditure (hence, its interest in Pay TV). The network fibre to date has been costed in on telephone applications, but this will never be justified to the curb or to the home.

This brings us back to the National Optical Fibre Network Project. The initiative appears to have arisen as a desirable national infrastructure project for job creation, Australian industry support and national stimulus reasons. In my view, it clearly needs more business input and policy alignment from the Government.

Several Government policy areas overlap this initiative. These include the relative roles of Telecom and Optus and their incentives for capital investment in the Customer Access Network (CAN). The carriers' activities in this area are largely driven by the Austel-administered local interconnect regime. Increased interconnect prices would give Telecom a larger economic incentive to invest in this area, and would also encourage Optus to look more seriously at its own local network infrastructure. Low interconnect prices drive Telecom to cost rationalisation rather than investment, and also discourage Optus from an active CAN role. Network boundary definitions, currently in debate within Austel, are also important. Where does the network end, and with it Telecom and Optus' responsibility relative to private enterprise contractors? Who owns the link to the home and thus the major funding responsibility?

Pay TV policy is also fundamental. Pay TV is one of the few early market driven opportunities that could channel investment into this area. However, current Government policy, whilst pitched as technologically neutral, is actively directing investment away from cable towards satellite for other reasons.

However, the real issue is not the choice of technology or the funding, but the market need. The business case doesn't yet stack up for Telecom and other carriers like NTT because the potential services and customers are not yet sufficiently clear to support the serious investment decisions that need to be made.

I am personally very nervous when Governments move to take initiatives that are not commercially fundable. In the case of the National Optical Fibre Network Project, it really does depend on how Government sees its role. If it can set a comprehensive and consistent policy framework which enables and encourages existing and new players to move in a direction dictated by market need, and simultaneously encourages participants to take a longer term view, then I am more relaxed.

If however, it wants to second-guess technology (e.g. by dictating fibre) and future services, with a short term view of creating jobs, then the outcome is fraught with danger, and commercial parties are unlikely to be party to the serious funding required. The initiative will then fall flat. We don't need super highways to the home unless there is going to be traffic to go over them, and we shouldn't start building the highways until we have a better view of where that traffic is coming from and who pays the toll.

Dr Chris Beare is a Director of merchant bank Hambros Australia Limited.

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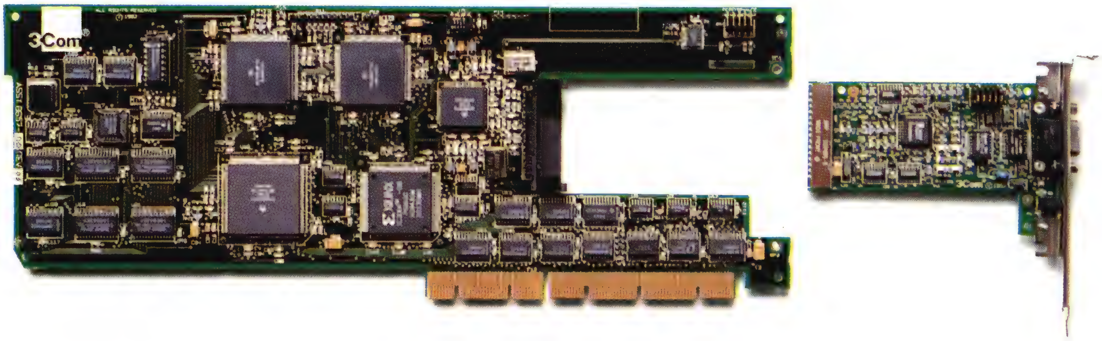

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Australia's Booming Export Industry

Over the past four years, Australia's telecommunications exports have quadrupled from $87 million in 1988 to $360 million in 1992. What strategies are in place to ensure this growth continues?

As Australia seeks to build on its telecommunications export efforts, targeting the rapidly growing Asia-Pacific market against stiff foreign competition, policy makers and industry leaders are increasingly concerned to ensure that the Government's projection of $2 billion in telecommunications exports over the next three to four years does not turn out to be a mere pipe dream.

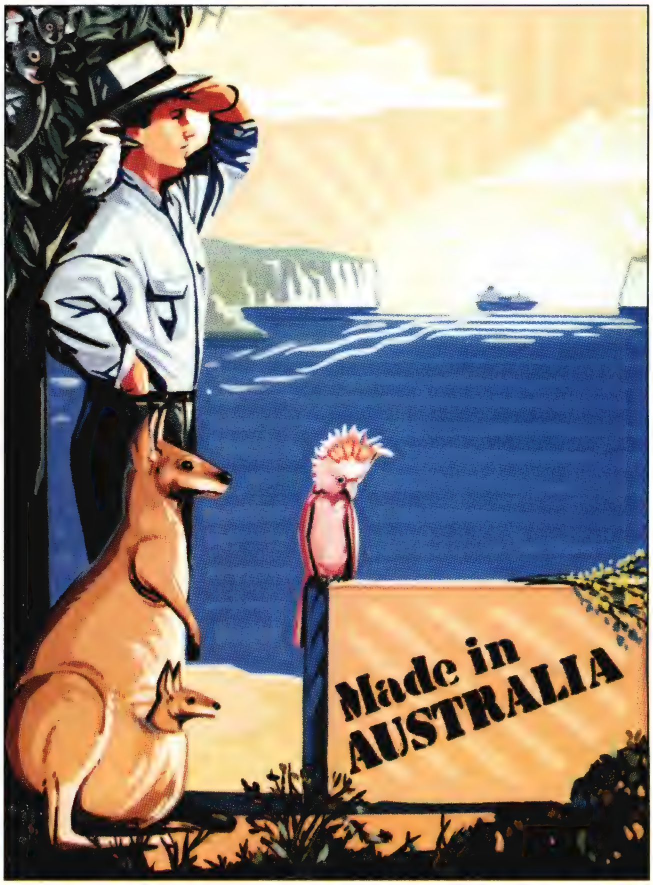
Few would disagree that vigorous attempts have been made to get the policy settings right and that the will is there among the industry's prime movers and policy makers. But none can ignore the realities of the global recession, looming regional trade wars, stiff competition from global heavyweights with deep pockets, differing standards and regulatory regimes and wildly varying levels of network sophistication.

Serious problems also afflict the very mechanisms government departments use to collect the necessary statistical data on which to base export projections. The problem is particularly acute in the area of software and services which has been much touted as a ticket to export success. Ultimately, the question begs: How can you make projections about the future — or set realistic targets — when you have no solid statistical data to measure your present performance, and hence no points of departure or relativities?

Other issues occupying the minds of the 'wise men's club' in Canberra and elsewhere are: How effective are government export incentive programs, and how much real assistance does Austrade deliver to exporters? Is the export market, particularly the Asian region, changing so rapidly that Australian policy makers are out of touch with regional realities?

While a $2 billion target in three to four years has a healthy, optimistic ring to it, there is an underlying feeling in the telecommunications industry that far more needs to be done to raise the efficiency of the various export enhancement mechanisms. These include export grants and insurance, concessional finance, making Australia a more attractive place for multinationals to take up residence, removing impediments to trade and breaking down trade barriers, promoting deregulation more widely and turning Austrade into a more effective trade facilitator.

So exactly what does Australia have to export, and who will want $2 billion worth of it a year by 1997? Broadly speaking, there are three main sources of potential export revenue. The first and most profitable is building and operating networks overseas; the second is selling Australian-produced hardware and providing services to support those new networks; the third lies in convincing transnational companies to establish regional Asia-Pacific telecommunications hubs and headquarters in Australia.



Any assessment of Australia's likely telecommunications export performance must start with Telstra and its designs on the Asia-Pacific market. The corporation has world class skills in installing and operating networks and is involved in 20 operating ventures in countries such as China, Vietnam, Laos, Cambodia, Hong Kong, Thailand, Pakistan and others, with several more significant deals

A Sampling of Australian Exporters

	WORLDWIDE SALES ($M)[1]	EXPORT SALES ($M)	MAIN MARKETS	PRODUCTS *N/A = Not Available*
Alcatel Australia	650	200	Asia, Europe	1A, 1D, 2A, 2C, 3C, 3G, 5J, 8A, 11C
AWA Communications	N/A	N/A	Asia, Sth America	3A, 3B, 5E
Binary Engineering	4	2.3	Asia, Europe	2G, 13D
Comsys International	10	8	Asia	2F, 6A, 6B, 6C, 6D, 6E, 6F, 6G, 7D, 9A, 10B, 12A, 13B
Datacraft	84	39[2]	Asia, Europe	5A, 5B, 5C, 5D, 5E, 5G, 5H, 5I, 6C, 6E, 6I, 7B, 7C, 7D, 10A, 10B
Digital Equipment Corporation	400	100	North America, Asia	5G, 5H, 6A, 6E, 6H, 7A, 11B, 11C, 13B
Ericsson Australia	N/A	N/A	Asia	1A, 1B, 1C, 2B, 2D, 3B, 4A, 4B
Exicom	133	25[3]	Asia, Middle East	3A, 3H, 5D, 8A
IRT Electronics	3.5	0.22	Asia, Europe	3C, 13E
JNA Telecommunications	31.9	0.49	Europe, Asia	5A, 5C, 5E, 5G
Jtec	18	1	Europe	5E, 5F, 5I, 5K, 7C, 12B, 13C
Mitec	10	2	Asia, North America	3D, 3E, 3F
NEC Australia	284.7	23.7	Asia	1B, 1C, 1D, 2A, 2B, 2C, 2D, 2E, 3A, 3B, 3C, 4A, 4C, 4D, 5C, 5E, 6D, 6J, 13A
NetComm Australia	23	3	North America, New Zealand	5D
QPSX Communications	14.5	10.1	Europe, North America	1E, 5A, 5H, 5L, 6B, 6H
Scitec Communication Systems	33.1	5	Europe, Asia	5A, 5B, 5C, 5D, 5E, 5F, 5G, 5H, 5I, 5J
Siemens	217[4]	22[4]	Asia, Europe	1D, 3B, 3C, 5E, 11A, 11D, 13B
Telecom Technologies	38	0.3	Pacific, Europe	1D

Notes:

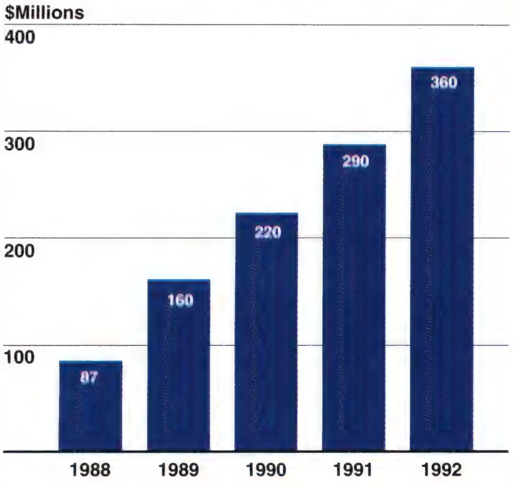
1. All sales and export figures are for the 1991/92 financial year, with the exceptions of: Alcatel Australia and NetComm Australia (1992 calendar year) and Jtec (1992/93 financial year).
2. This figure represents Datacraft's total offshore sales.
3. Exicom's export sales revenue is split between its Australian ($10 million) and New Zealand ($15 million) operations.
4. Siemens figures include non-telecommunications activities. Telecommunications and manufacturing comprised around 30% of sales and around 60% of exports for the period.

Product Key:

Switching
1A Public Exchange
1B PABX
1C Automatic Call Distributors
1D Key Systems
1E Integrated Service Cell Switches
Tel. System Attachments
2A Analogue Handsets
2B Digital Handsets
2C Systems Integral Handsets
2D Headsets
2E Voice Mail
2F Voice Network Management
2G Communications Logging Recorders
Transmission Equipment
3A Radio
3B Microwave
3C Fibre Optic
3D Satellite
3E Terrestrial Antennae
3F Satellite Antennae
3G PCM
3H Pair-Gain Systems
Mobile Communications
4A Mobile Telephones
4B Mobile Switching
4C Radio Paging
4D Mobile Data Terminals
Terminal Equipment
5A Bandwidth Handlers
5B Data Terminal Handlers
5C Link Terminating Equipment
5D Modems
5E Multiplexers
5F Facsimiles
5G X.25
5H Frame Relay
5I ISDN Terminal Adaptors
5J MAN
5K ISDN Workstation
5L SMDS
Networking — Hardware
6A Hubs
6B Bridges
6C Routers
6D Repeaters
6E Terminal Servers
6F File Servers
6G Workstations
6H Network Adaptor Cards
6I Gateway/Emulation Cards
6J Printers
Networking — Software
7A Network Operating Systems
7B Routers
7C Gateways/Emulators
7D Network Management
Power
8A Power Supplies
EDI
9A Software
Electronic Mail
10A X.400/X.500 Systems
10B Software
Cabling
11A Cable Management Systems
11B Coax/Twisted Metal
11C Fibre Optic
11D MDF
Test Equipment
12A CCITT Digital Transmission
12B WAN Analysers
Miscellaneous
13A Audio Conferencing Systems
13B Racks & Cabinets
13C Security Systems
13D Low Bit Rate Voice Codecs
13E Broadcast Equipment

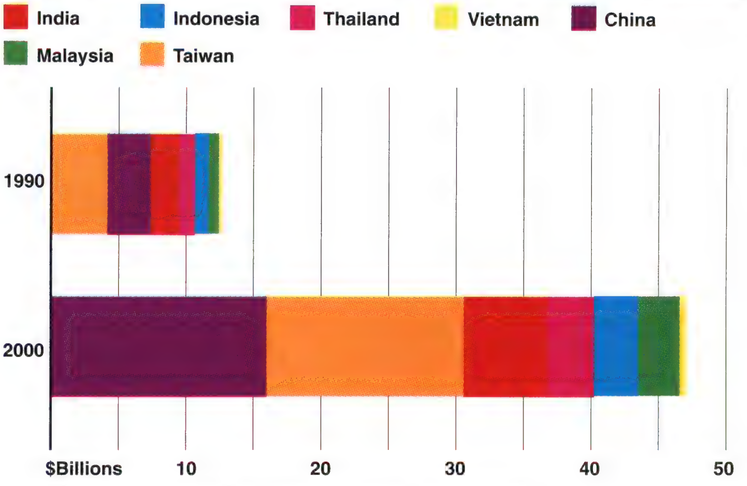
in the pipeline. All senior Telstra management, including CEO, Frank Blount, and Group Managing Director, Commercial and Consumer, Doug Campbell, have at various times recently insisted that the corporation's aim is to derive 10% of its revenues from offshore within five years, equivalent to some $1.5-$2 billion by 1998. This would tend to make the Government's target of $2 billion by 1997 look well within range, given the swathe of multinational branches and generic local companies contributing to the export tally.

Giants like Ericsson and Alcatel lead the way as equipment suppliers, followed by AWA and Siemens and middle-sized operations such as Motorola, Olex Cables, Exicom and Stanilite Pacific. The next level takes in the smaller local companies producing innovative gadgetry or systems such as Jtec, Scitec, NetComm, JNA, QPSX, Stallion Technologies, ERG and others. Then there are the local software and service providers such as Ferntree, Datacraft and Comsys, providing solutions for everything from EDI to submarine cable traffic surveillance.



Telecommunications Equipment Exports

Source: AEEMA



Selected Asian Telecommunications Expenditure Projections

Source: J. Zerby, Centre for Applied Economic Research, University of NSW

Lobbying For Success

Executive Director of the Australian Electrical and Electronic Manufacturers' Association (AEEMA), Alex Gosman, whose 250-member group plays an influential role in bringing industry and government together on telecommunications issues, believes the $2 billion export target is quite achievable.

Noting that the Australian telecommunications equipment industry is the only integrated manufacturing sector of the information industries in which Australia has a significant presence, Gosman says the equipment industry provides a net benefit to the economy of $3 billion a year in terms of import replacement and exports.

Not surprisingly, Gosman is keen to see a continuation of Telstra's fostering of the Australian industry by buying locally, rather than shopping around the world for the best deals. As Gosman sees it, the Government's role in the export drive is to remove all impediments to the export effort, provide greater incentives and ensure that the domestic environment encourages the investment needed for competitive manufacturing and exporting.

Great export opportunities have been presented by the globalisation of the telecommunications market as a result of the move away from monopoly carriers and towards a uniformity of standards, Gosman says. But Australia must use all its human, technological and political resources to join the globalisation process before it is too late.

Gosman says that while Australian telecommunications exports were limited before the mid-1980s, over the past four years they have quadrupled from $87 million in 1988 to $360 million in 1992 with exports in 1992 alone increasing by more than 25%.

The 1986 Communications Equipment Export Strategy, an industry-government initiative to boost exports, set goals of $200 million for 1992 and $600 million by 1996, but the actual 1992 figure was 70% above the target, Gosman says.

AEEMA exercises an enormous amount of power through the Canberra and State government lobby networks. The group's views are closely noted by all the relevant Federal departments, such as Transport and Communications (DOTAC), Industry, Technology and Regional Development (DITARD), Foreign Affairs and Trade (DFAT), Austrade, as well as Treasury and Finance. Whatever the issue, AEEMA ensures that the equipment manufacturers' position is made known to politicians and the machinery of government.

On the export front, AEEMA has a significant input into the Government's Telecommunications Export Task Force (TETF), set up late last year to boost exports of products and services. Through its Telecommunications Export Development Group (TEDG), and by providing secretarial resources to TETF, AEEMA has ensured that the task force is industry-driven.

With Telstra as a powerful ally, the export goals and other interests of AEEMA's members are well served by having the Managing Director of Telstra OTC International (formerly the International Business Unit, OTC), Peter Shore, as TETF Chairman. Others represented on the TETF include Optus, Vodafone, DOTAC, DITARD, DFAT, Austrade, State Government representatives, members of the AIIA, ATUG and service provider AAP Telecommunications. AEEMA's influence also extends to the Asia-Pacific Economic Cooperation group (APEC) and its Working Group on Telecommunications (TWG), which promotes itself as the key regional forum for telecommunications dialogue in the Asia-Pacific.

In context, it's interesting to note that because of the fundamental convergence of regional interests between Japan and Australia, some at the highest levels of government in Canberra are disturbed by moves in the US to extend the North American Free Trade Agreement (NAFTA) into Asia by targeting individual countries one at a time and forcing them to make a choice between the US or Japan. The drift in Washington away from the previous consensus in favour of free trade under the General Agreement on Tariffs and Trade (GATT) may tend to reinforce support for the APEC agenda in some quarters of Canberra.

As a government agency, the TETF collectively is more concerned with the broader issues. But it doesn't take too much reading between the lines to detect that one of AEEMA's pet concerns is an apparently 'negative attitude towards export support' within DOTAC and other departments. Another bug bear appears to be the performance of Austrade.

Austrade's Performance

Austrade has come in for some fairly stringent criticism from industry, the most serious being that some of its officers suffer 'diplomat's disease,' a euphemism for nasty words like out of touch and poorly focused.

Industry has made it more than clear to the TETF that Austrade officers overseas must fully understand the capabilities of the Australian telecommunications industry. Some AEEMA members have suggested that rather than conducting briefing sessions for Austrade officers on their periodic visits to Australia, members of the TEDG should go to the Austrade posts overseas to demonstrate the technological capabilities of Australian products and services.

Austrade's National Manager, Telecommunications and Information Technology, Dr Roger Knight, accepts that Austrade's overseas network and its 1,000-odd employees are under-utilised by Australian industry. This is particularly the case in Asia where Austrade has a total of 180 staff, 80 of them in South East Asia.

But he says a Special Trade Commissioner has been appointed in Hong Kong to concentrate on a select group of four Australian companies now involved in a "very expensive exercise," whose success will have a pull-through effect on other Australian operations. "We are now active in Indonesia, China, Vietnam and elsewhere and we are prepared to put on staff as recommended by the TETF," he says. While it's valid to ask "Where does Austrade add value?," Knight says it's often difficult to quantify in dollar terms the total benefits of facilitation.

But he points out that Austrade has helped Australian companies win millions of dollars in export contracts by taking part in the major overseas telecommunications industry trade shows. For example, nine Australian companies — Olex Cables, AWA Communications, Datacraft, Ericsson Australia, Electrodata, Exicom Australia, Pirelli Cables Australia, Teletech and Voxson — won business worth an estimated $87 million over 12 months after attending the Expo Comm China '92 in Beijing. Austrade is now busily promoting the prestigious CeBIT Trade Fair in Hanover in 1995.

Austrade Chairman, Bill Ferris, has enthused to American Club audiences and other forums about the phenomenal market growth rates in Asia and how Austrade is putting 50% of all its offshore resources into the region. He talks robustly about the rise in exports of elaborately transformed manufactures (ETMs) to Asia and Austrade's efforts to penetrate the tough Japanese market through Tokyo's Foreign Access Zones scheme. He also cites figures showing that Australia sold more to Taiwan last financial year, $2.5 billion, than it did to its once primary market, Britain, which accounted for just $1.8 billion.

Ferris sees an excellent role model for Australian industry coming from a group he calls the 'gloombusters' in the 'second tier' of the Australia economy; those thousands of innovative small and medium sized companies which are increasing their competitiveness and generating offshore revenues. Many smaller Australian telecommunications innovators would fit the bill.

TIDA's Role

Although on the back-burner, but nonetheless still simmering away, the possible privatisation of Telstra and the impact on exports has caused considerable concern in parts of the Australian equipment manufacturing sector. This is revealed in a draft paper from a pre-election meeting between the Telecommunications Industry Development Authority (TIDA) and industry leaders.

'If AOTC went to the highest bidder, industry is concerned that as the buyer introduces its organisation and looks to establish suppliers in other countries, the local industry could be decimated,' the paper says, claiming that this had happened in New Zealand. 'With privatisation in NZ, the price of shares of NZ Telecom became paramount and investment by the company is being severely reduced and export growth abandoned to contain costs and maximise short term return to the major shareholders.'

AWA Communications Corporate Marketing and Business Development Manager, Bruce Cooper, says TIDA is an excellent forum for industry to make recommendations to the ministerial level of government. But because it's still in its fledgling stages and in a "condition of some fragility," TIDA could be undermined by certain interests if local industry groups do not get behind it, he says.

With multinational companies accounting for some 90% of telecommunications industry output in Australia, Cooper says such an environment is not necessarily conducive to producing an export-focused local industry. He says it's vital that local industry supports TIDA in its efforts to develop an export culture and to define the kinds of products that will break ground overseas and help achieve the $2 billion target. "The $2 billion is quite achievable if Telstra gets going and has a couple of big wins," he says. Even more important than setting a target or dollar figure is nurturing the momentum for an exports drive, a process that has been helped along by the TETF's establishment, Cooper claims, adding that the TETF, like TIDA, will need around four to five years to get to grips with the issues and define its role.

The Statistical Black Hole

The Government's statistical blind spot on software and services is more than adequately outlined by those with the task of making concrete decisions based on virtually non-existent data.

At the Department of Industry, Technology and Regional Development (DITARD), Acting Director, Government Purchasing Section, Information Industries Strategy Branch, Ian McAlister, says while statistics on hardware exports are okay, "we fall down badly in the area of computer software and telecommunications services."

McAlister says he estimates telecommunications exports of $1.6 billion by the end of 1996, based on figures on hardware exports from the Australian Bureau of Statistics, industry groups such as the Australian Information Industry Association (AIIA) and the International Data Corporation (IDC). But when it comes to software and services, which have never before been factored into export projections, McAlister concedes: "We just don't know."

Peter Moore, General Manager of DITARD's Telecommunications Policy Division, who oversees a variety of industry/government interfaces, concedes there is a "statistical vacuum," which he labels a "shocking situation" which needs urgently to be addressed.

Some industry leaders have even speculated that the $2 billion target for telecommunications exports by 1997 may have been a 'quick and dirty' figure plucked out of the air by bureaucrats and advisers to the former Minister, Senator John Button, and that the heat may have been turned up to produce a 'good number' in the run-up to the March election.

According to McAlister, the software and services picture should become clearer before too long, with the Australian Bureau of Statistics spending large sums of money to improve its coverage of these areas, and DITARD itself assigning a Strategic Development Officer to review and collate its sources of statistical information on telecommunications exports.

Consultant to the AIIA as well as other industry bodies and government agencies, Rod Price, describes the collection of statistics on IT and telecommunications software and services as "miserable." The problem is that software is evaluated on the medium in which it is embodied, for example, a computer disk, he says.

"Software and services do finally make it into the current account figures, but this is through the recording of money movements in and out of the country, not from any precise recording of actual industry trade figures," he says. To be completely consistent, Price says, the same rules should apply to merchandise trade and non-merchandise trade. "At the moment, there aren't even any codes to cover software and services."

The Asian Market

One of the most common mistakes Australians make is to regard Asia as a single trading block, when it is in fact a group of very different countries with very different laws, languages and social and business cultures.

The word 'facilitation' often comes into the export lexicon, and like much Canberra-speak, has become part of the language of the adaptable truth. For James Barr of the International Branch of DOTAC's Telecommunications Policy Division, the term essentially equates to government-to-government contact designed to ensure Australian participation in telecommunications infrastructure projects in the particular country. In other words, DOTAC and other departments contact the corresponding departments in the target nation and this process is augmented by ministerial visits and lower-level diplomatic exchanges.

But at the less delicate business end, experienced hands-on operators will attest

Continued on page 69

The Export Experience

Product diversity is one of the more encouraging aspects of Australia's communications export industry. The companies below represent only some of the hardware, software and services on offer.

ALCATEL

Alcatel Australia's export revenue grew from $36 million in 1989 to $150 million in 1991, and the company says such growth levels are continuing, based on exports of its switching systems, transmission systems, customer premises equipment, network infrastructures, submarine fibre optical cable systems, GSM digital mobile communications systems and a new range of Australian-designed solderless audio connectors.

Alcatel has also supplied a digital telecommunications network to Papua New Guinea, which included 15,000 advanced digital handsets. In the GSM markets of Hong Kong, and Delhi and Bombay in India, Alcatel is the major supplier of handsets and a strategic project manager in joint ventures between Telstra and local service providers.

From its $120 million submarine cable manufacturing facility in Sydney, Alcatel has supplied hundreds of millions of dollars worth of cable and repeaters for such projects as the Tasman 2 link, the 3,600km PacRimEast and the 7,000km PacRim-West projects and the Jakarta-Djibouti section of the SEA-ME-WE2 link between Singapore and Europe.

AWA COMMUNICATIONS

AWA Limited, the parent of AWA Communications, has set an export target of $60 million for 1993/93, some 30% of that figure coming from telecommunications products. The company's other major exports are traffic control systems and air navigation solutions.

AWA Communications successfully leveraged its expertise in Australian outback rural and remote transmission to win a five-year contract in Vietnam worth $20 million to supply digital microwave radio terminals and multiplex equipment, as well as radio terminals and radio kits. An example of the pull-through effect of this contract is the Melbourne antenna equipment manufacturer, RFS, which exports goods worth almost $1 million a year to Vietnam through AWA.

With contracts for air traffic control equipment and digital mobile radios worth many millions of dollars in China in 1992/93, AWA has opened an office in Beijing.

AWA Communications also has business in Central and South America, supplying private networks for multinational companies such as Colgate Palmolive in Venezuela and the Cargill company in Argentina, as well as for the Telecommunications Authority of Belize.

COMSYS

System integrator Comsys International bases its export hopes on its core Multiple Access Control Unit (MACU), a starting-point surveillance platform for telecommunications operators and regulators. Comsys scored in Sri Lanka with a $3 million contract to allow the local regulator to monitor local operations and operator obligations. Comsys expects further successes as the Sri Lankans double the size of their network in a deal worth $150-$180 million. The Perth company also expects to sign a deal with IndoSat, taking a $100,000 slice of a total $5 million contract.

Now under the NorTel wing after being bought by STC, Comsys says its great advantage is that while giants like Ericsson, Alcatel and others offer network management tools exclusive to their products, Comsys can manage many different kinds of systems, including older networks in need of upgrading.

With 40-odd staff, the company had revenues of $8 million in 1991/92 but is looking to reach $20 million within three to five years as its marketing approach becomes more aggressive.

DATACRAFT

Leading Australian communications developer and software and services provider, Datacraft, has recorded considerable success in export markets and is something of a role model for Australian innovators. Turnover from its Asian operations has increased from $2.5 million in 1984/85 to $30 million last year. The company predicts revenues of $90 million over the next three years, split equally between its domestic and export revenues.

With offices throughout the Asian region, as well as in New Zealand, Papua New Guinea and the UK, the pioneering, publicly-listed Australian company provides marketing, systems engineering and customer support for customers using a range of OSI products and other sophisticated connectivity technologies and protocol implementation applications.

Within Europe, Datacraft products are mostly marketed under OEM agreements with larger local vendors, such as ICL. Exports to Europe have included AP4000 router technology, in particular terminal server applications to IBM, Digital Equipment Corporation and ICL via X.25 wide area network applications. In the past two years, Datacraft has exported $3 million worth of AP4000 technology to the UK and Europe.

Datacraft also recently signed a deal with Hong Kong Telecom for network terminating units for digital data services, expected to result in sales of $12 million.

ERICSSON

Ericsson Australia has shipped its locally-designed ACP 1000 automatic call distributor to more than 25 countries, ranging from Asia to the Middle East and Europe. The company's public switching product, the AXE 10, also Australian-manufactured, has been exported to Vietnam, Cambodia, Burma, Laos and China as well as Papua New Guinea, Fiji, Tonga, Western Samoa, New Zealand and Tuvalu. Negotiations on the AXE 10 are also in progress with Japanese companies.

Ericsson mobile phones are installed or now on order in New Zealand, Vietnam, Burma and Sri Lanka. The company also points out that all its export markets have other services provided from Australia, including installation, training, maintenance support, software support and network planning assistance.

As a general rule, the Swedish-parented subsidiary does not give local export revenues or projections. But the company's share of the global switching market and the digital cellular mobile scene ensures the figures will be in the hundreds of millions of dollars, and rising.

ERG

ERG Australia's core telecommunications products are its Radiolab range, including radio base stations and paging transmitters, targeted mainly at the Asian market. The radio base stations are sold to Nokia Telecommunications and Philips Industries in Australia and are used in the Telecom Fleetcom and private trunked radio systems.

ERG's paging transmitters are sold locally to Link (BellSouth), Hutchison and Telecom. Export sales have been made to Hong Kong, the Philippines, Malaysia, Thailand and Korea. A recent contract for transmitters to China was worth $2.5 million. In Korea, an deal has been struck with Goldstar to distribute the product and sales into Asia are expected to dramatically increase in the next 12-18 months.

In its partnership with Nokia, as a supplier to Optus, ERG has a licence/technology transfer agreement which allows it to supply GSM base stations to the New Zealand market. Under the ERG/Nokia arrangement, both companies are committed to jointly developing new products primarily for the export market.

The Export Experience (continued)

ERG turnover has grown from around $13 million in 1991, to $25 million in 1992; $50 million has been forecast for 1993. With a new $7 million manufacturing facility in Perth, the company spends 10-15% of turnover on R&D.

EXICOM

Exicom is increasingly looking offshore and expects a third of its overall business to be generated by exports within two years. In 1991/92, of the total one million telephone handsets produced at its plant in Sydney, the company shipped 200,000 units to the Middle East, Hong Kong, Singapore, Papua New Guinea, Indonesia, Vietnam and New Zealand. The company recently announced that it had exceeded its 1992/93 export target of 250,000 units.

Exicom also makes switch components for Northern Telecom, producing 50,000 line cards for the North American market, as well as 'teledaptor' units, developed by NorTel and Wollongong University. The company also recently announced an order from the Dutch PTT for the supply of a new small PABX.

Exicom is also exporting its telecommunications power equipment to more than a dozen countries in Asia and the Pacific. The biggest market is in China, where Exicom is in joint venture with the Dongguan power supply company. The deal will see $14 million of Australian-manufactured power products shipped to China by the end of this year, with partial local assembly leading to full-scale assembly by 1996 and projected annual sales by then of $40 million.

Through its New Zealand subsidiary, Exicom also goes after radio-based rural communications markets in 60 countries in Asia, Africa, the Pacific and South America. It recently won a $10 million contract to provide dual-channel radio telephone links to Telecom Malaysia.

JN ALMGREN

JNA has hitched its export prospects to its universal multiplexer, which Telecom dubs the Unimux and installs as customer premises equipment for its Flexnet digital data network service. For the export market, JNA calls it the AS 200, and has high hopes for sales in Italy and elsewhere through its alliance with Italian electronic engineering giant Alenia SPA, a $US4 billion company.

JNA, which has an office in Brussels, believes that if present market opportunities through Alenia are successfully exploited, volume deliveries will flow in 1993/94 and 1994/95. JNA is also carefully eyeing the Asian market, where its prospects hinge largely on Telstra's efforts in developed markets.

JTEC

ISDN network specialist, Jtec, is tackling the export market seriously for the first time this year with certification for its ISDN network multiplexer, the J1000, pending in the UK. From there, Jtec will target Germany, France, Scandinavia and other parts of Europe.

"Jtec's products are for mature ISDN markets, so in the Asia Pacific region, we would be looking at places like Singapore, Hong Kong and the 'new Asian tigers' such as Korea and China," says Marketing Manager, Keith Murray. Jtec, with 135 staff in Australia, an R&D facility in Ireland and a sales office in the UK, expects its revenues to rise from $10.2 million in 1991-92 to $20 million in 1992-93 and $34 million by 1993-94. The increase will in part be due to a deal in which Jtec ISDN terminal adaptor technology will be incorporated into the US-based Retix's network traffic router.

Jtec Executive Chairman, John Reidl, thanks DITARD's Industry Research and Development Board for a discretionary grant of $2 million to develop the J2000 multimedia document handler. He also believes the Export Markets Development Grants Scheme (EMDGS) is an excellent 'psychological boost' for budding exporters. "We are spending around $1.5 million to get offshore, without a single order yet, and getting half of that back under the EMDGS is a huge help," Reidl says.

NETCOMM

An example of how export dreams can evaporate comes from modem maker NetComm Australia.Local market leader and a member of the Communications Cluster of Australia, NetComm had its sights on the UK and Europe through a UK-based distributorship deal, overseen by former staffer Bruce Reid, which is now being wound up.

Two years ago, NetComm was riding high on its offshore plans; it had the support of the EMDGS, the 150% R&D tax concession and the computer manufacturing bounty. The company also had an export track record, having shipped modems to the US, New Zealand, the UK and Holland. Back in 1988 it scored a coup by winning modem orders from Japan's NTT.

The lesson for NetComm? "If you do try to export, keep your eye on the your domestic base at the same time," says Managing Director, Chris Howells. "The UK operation took up an inordinate amount of time and we finally failed to crack a market worth up to $300 million a year. We've had to give up on exports in the short term."

Nonetheless, having cut casual staff by 20 to around 110 and renegotiated a variety of contracts late last year, NetComm expects its domestic/New Zealand operations to produce earnings in 1992-93 at least equal to the 15% increase experienced in 1991/92. That forecast is based on annual sales of 60-70,000 units for turnover of around $25 million.

OLEX CABLES AND MM CABLES

In the cabling market, rivals Olex Cables and MM Cables have scored well in China and other parts of Asia.

From its 800-staff plant in Melbourne, Olex Cables, a Pacific Dunlop subsidiary, is among the leading makers of cable in Australasia, producing 1,700km of optical fibre cable under a $30 million export contract based on Australian aid to China, and recently completing a 2,000 kilometre optical fibre cable contract in Pakistan. Its export successes have helped maintain annual revenues at around $500 million.

MM Cables, the local subsidiary of the BICC worldwide group, has had its biggest success in Thailand and Malaysia, where it has become the sole supplier of optical fibre for the railways. MM Cables has also supplied 1,000km of optical fibre to various Chinese provinces targeted as special economic zones.

QPSX

QPSX's export prospects are strong, despite the fact that the company licenses its metropolitan area network (MAN) technology to global giants Alcatel and Siemens. Over the past three years, QPSX exported a significant amount of equipment to Europe and the US while Alcatel and Siemens were ramping up their own production lines. In 1991/92 equipment exports totalled just under $10 million.

While QPSX relies largely on its Alcatel/Siemens contracts for sales into overseas markets, it is now embarking on a push into South East Asia and the US, either directly or through distributors.

A number of prospects have been identified in Taiwan, Thailand and Singapore, with strong interest from China and Korea. In the US, the private network market is being targeted, even though the original technology was developed with Telecom Australia support for public switched high speed networks to provide services like Fastpac. QPSX has also recently developed an 802.6/ATM chipset which is expected to generate significant sales in the US.
Bernard Levy

From page 64

that while slipping briefcases of hard currency to middle men and fixers may jar the high moral principles of Australian business, such transactions are an accepted fact of life in many parts of Asia.

This process is easier in countries like Singapore and Malaysia, former British colonies with largely English-based laws, but requires more work in places like Indonesia, with its Dutch-based law, and Thailand, with its version of the Napoleonic code.

George Maltby, Chairman of ATUG and member of the Telecommunications Export Task Force (TETF), says Australian companies don't work in with each other or network as well as their counterparts do in parts of Asia. "Whereas Japanese industry, government and other interest groups jointly focus their energies on their goals, we don't joint venture or share information enough," he says. Establishing the TETF was a positive development, but the telecommunications industry needs to "be seized with the mood to succeed," he says.

"Australia has considerable skills at the value-added end and is recognised in the Asia-Pacific as having top services and products. But we must maximise these advantages by promoting education and telecommunications training and by advising governments on the benefits of deregulating their markets. It's a tiresome road, but we must travel it."

Maltby also strongly endorses more bilateral talks between Australia and its Asian neighbours, in tandem with multilateral negotiations aimed at breaking down regional trade barriers.

Some impressive figures on growth of the Asia-Pacific market come from John Zerby, Senior Lecturer at the University of NSW's Department of Econometrics, who looked at 22 countries in the region, and whose research is used by the Bureau of Transport and Communications Economics.

Zerby divides the countries into five groups according to the sophistication of their telecommunications systems, and views each country in terms of population growth, Gross National Product and projected telecommunications expenditures out to the year 2000. From the low telecommunications technology countries, such as Bangladesh, Sri Lanka, India and Nepal, through to the high technology countries such as Hong Kong, Singapore and Taiwan, the growth estimates are staggering.

Those countries identified by Australian industry as the most lucrative potential markets — China, Vietnam, Indonesia and to a lesser extent Thailand — will experience increases of over 400% in telecommunications expenditures, from $US5.07 billion to $US22.90 billion. The growth rates for the other groups are only slightly less impressive at around 300%.

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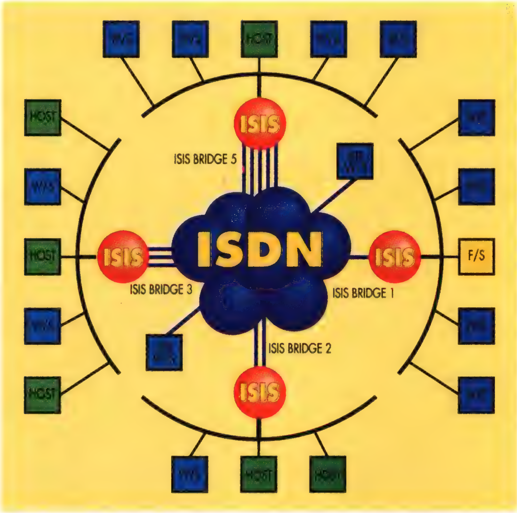

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According to Zerby, Australia's best chance of capitalising on this blossoming market is in providing services, such as network operation and support, training and conducting independent monitoring of contracts. As an example of new kinds of business opportunities, Zerby says by the end of the decade, office block owners will employ consultants to talk with tenants about their in-office communications needs. The consultant will then put together a customised package for the tenant and have it installed.

But Zerby stresses that because networking is almost second nature to North Asian business people, Australian companies that don't make close personal contacts risk being secretly shut out by a long-standing and effective non-tariff trade barrier.

In China, Hong Kong, Korea and Taiwan, defined by US consultants Pyramid Research as East Asia, the market for telecommunications equipment will climb to more than $15.3 billion in 1995, based on a 14% annual increase over the 1991 market of $9 billion.

Pyramid's *Telecom Markets in East Asia* report says the number of subscribers in the region will grow from 32 million in 1991 to 51 million in 1995. The corresponding number of cellular mobile users is forecast to increase from 542,000 in 1991 to 2.5 million in 1995.

The report says much of the growth will be driven by the telecommunications needs of China alone; with a population of 1.13 billion, basic telephone expansion has become the overriding priority of the Ministry of Posts and Telecommunication (MPT). But in Korea, Hong Kong and Taiwan, the motivation is to become the dominant business centre in Asia.

The Pyramid report says that by the end of 1996, Korea Telecom plans to install 8.7 million lines, of which two million will be allocated to rural development areas. KT's plans call for a 69% digitalisation of its local switch base and 100% of its transmission circuits by the end of 1996, including advanced features such as nationwide ISDN-based data and imaging services. There are similar plans in Taiwan, though Pyramid Research says Hong Kong has the most ambitious network development plan, aiming for 100% digitalisation sometime this year.

Significantly for Australian exporters, the report says that with the exception of Hong Kong, East Asian policy makers face the conflicting interests of their business communities, who need access to state-of-the-art equipment at competitive prices, and their own telecommunications manufacturing base, which clamours for protection.

In its dreams of becoming the Asia-Pacific hubbing centre of choice, Australia now faces overwhelming competition from places like Singapore. Telstra's Group Managing Director, Steve Burdon, and International Managing Director, Peter Shore, have both exhaustively outlined Australia's numerous technological, economic and cultural advantages. They point to a client list that includes County Natwest Bank, Tullet & Tokyo, Prime Computer, Memorex Telex, Ericsson, Sheraton Hotels, global airline booking group SITA, IBM and Cathay Pacific. Cathay, servicing operations in 164-plus countries, was lured to Australia against strong competition from Singapore, China and Canada.

But Australia can do even better, says lawyer and export adviser, Gerald Wakefield, if it takes a leaf from Singapore's book and seeks to match some of the island state's range of incentives and inducements to overseas businesses.

These include no capital gains tax, no requirement for a local partner, limited restrictions on property ownership, tax holidays of up to 10 years for 'pioneer' companies with extensions going out to 15 years and reduced tax rates of around 21% for 'post-pioneer' operations. "Compared with what Singapore is offering, there are few reasons for a lot of big North American and European companies to establish bases in Australia," Wakefield says.

In competition with the Japanese, offering long deferred payments on loans at 2%, Australia's response has been to try to persuade the members of various world forums to play fair. While agreements have been reached, the commercial reality is that soft loans have virtually doubled in the past half-decade.

According to George Maltby, Australia is better positioned for export contracts in the tens of millions of dollars rather than the hundreds of millions, so concessional finance is not such a barrier. "But you cannot stop concessional finance and Australian companies must fight for contracts on their merits. If they win enough, they'll succeed."

No More Free Rides

The relationship between Telstra and its local suppliers is about to undergo a profound change. Over the past decade, dozens of Australian companies have ridden the Telecom/OTC juggernaut into foreign markets. But these suppliers have had little or no contact with the customer nations themselves. Instead, they sold their products and services to the former monopolists, which then shipped them abroad.

Reflecting on the past relationship between Telecom/OTC and local industry, Shore admits that things were far from perfect during the 1980s. Describing the relationship as "fairly ad hoc," he says there were few formal mechanisms for promoting the joint planning or execution of overseas projects. "We did not develop a cooperation or open relationship — as a consequence we did not share much risk," he says.

But despite these shortcomings, the relationship was "relatively successful" in providing significant opportunities for exports. Shore cited the Vietnam experience where some 60 companies benefited, and Pakistan, where Olex Cables and others scored heavily.

"From our perspective, we didn't give suppliers a clear understanding of what we were seeking to achieve offshore, or a clear idea of how we viewed their involvement in our activities," Shore concedes.

"TAI and OTCI were going through a steep learning curve and trying to manage the fastest rate of change the companies could withstand. But it meant that we tended to scramble for opportunities, secure a licence or win a contract and then work out the detailed practicalities including whose technologies and equipment we were going to use. This was not easy for industry to respond to, and it meant that in the bidding phase we hardly ever acted in concert."

In OTCI/TAI's defence, Shore criticised industry, saying that until very recently, it had generally been focused on the domestic Australian market rather than export opportunities. In addition, low production runs and difficulties with management practices sometimes led to problems in supply and caused difficulties for OTCI/TAI in meeting their overseas commitments. "OTCI and TAI often felt that they were doing all the hard work in the market . . . with little support from the industry, even though they reaped the benefits too."

Shore warns that the intensity of international competition means there is only limited time to strengthen the Telstra/industry relationship because "the markets will not wait for us to get our act together."

New Faces at the Helm

Whether or not the golden export dream becomes a reality by the late 1990s now rests to some degree on the leadership qualities of the two new faces heading the ministries directly covering telecommunications. Minister for Communications, David Beddall, brings a strong interest in export promotion from his previous job as Small Business, Construction and Customs Minister. He has effectively become an assistant to Senator Bob Collins in handling the massive Transport and Communications portfolio. Alan Griffiths, Senator John Button's successor as the new Industry, Technology and Regional Development Minister also brings considerable expertise in export matters from his previous Tourism and Resources portfolio.

The presence of these men may help ensure that the next decade will be the one that brings home the bacon, after almost as long spent drafting and refining what may or may not turn out to be a workable telecommunications export master plan.

Bernard Levy is a freelance journalist based in Byron Bay (NSW).

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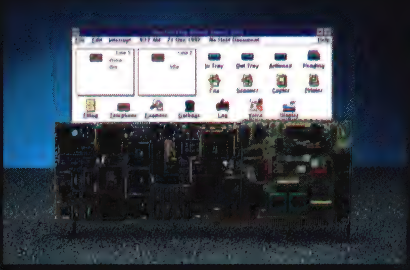

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Getting the Most From Mobile Technology

There are four ways to 'extend' a wireless telephony standard:

- Increasing the bandwidth available, which is what was done in Europe with the analogue systems with E-TACS, but this leaves all older handsets unable to use the new frequencies. However, it does off-load newcomers to the system and improve the channel load factors.
- Reducing the channel-size each mobile link occupies. In digital systems this requires the use of lower bit-rate voice coders, and since the quality of these is improving dramatically at the present moment, the use of 'half-rate vocoders' is a very viable technique.
- By using speech interpolation techniques. Since one side in any conversation is always listening, it seems to be a pity to waste bandwidth by continually transmitting 'listener' channels which don't contain any useful information. Modern speech interpolation techniques give two-times gains with mobile telephony channels (and much more on optical fibre) through switching off the channel when it is not in use. But don't confuse this with GSM's reduction in power to prevent interference.
- Reusing the channels more in adjacent cells by reducing the spread of interference. GSM's discontinuous transmission (DTx) which acts to lower the power whenever the user isn't speaking (primarily to save on battery), has the effect of reducing noise in surrounding channels. In fixed (wireless local loop) applications, the system can also be extended by using highly directional antenna, and in fact, use a cell-reuse pattern of 4 (each cell has one-quarter the total bandwidth), instead of cell-reuse figures like 7, 9 and 12.

Extended-TDMA, which was devised by Hughes and recently trialled by BellSouth in Mobile, Alabama, plans to use the first three techniques for mobiles (the first only when extra bandwidth can be provided — not in the US), and the fourth for fixed applications. It is the half-rate coding and digital speech interpolation (DSI) which are the core technologies.

Half-rate coding depends on the quality of the low bit-rate vocoder, and since D-AMPS normally uses an 8Kbps vocoder, this means that the voice is now down at 4Kbps, which is at the margin between voice-recognition and voice-intelligibility. There's no doubt that you can understand the words being spoken in most 4Kbps vocoders, and you can tell the difference between male and female voices, but it is often difficult to recognise the individual to whom that voice belongs.

Some of the new MBE (Multi-Band Excitation from MIT) vocoders give both good intelligibility and recognition at 4-Kbps, as do the new CELP-LPC vocoders, but they are still far too expensive to use in cheap mobile handsets. Undoubtedly they will migrate to mobile telephony at a later date, and improve the systems. (CDMA can also use them very easily, without changing the transmission standard).

The DSI speech interpolation, however, is more of a problem. It requires a substantial amount of computer processing, since the signal processor needs to establish a threshold at which to switch on and off, and any delays in the switching action result in voice clipping.

Hughes E-TDMA system also drops the time-slots/channels when they are not being used and re-establishes them when the user starts to speak. But since the slot may have been reassigned in the meantime, this requires a process which is virtually a single-channel hand-off between every spoken phrase. Hughes is both frequency-hopping and slot-hopping between each phrase, and BellSouth's tests show that the voice is clipped and a bit rough with the present vocoder. In the words of one analyst, "it sure doesn't sound so good."

However, they do get a two-times gain out of the low-rate vocoder and between 2 and 2.7-gain out of the speech interpolation, so overall they are getting capacity improvements in the order of 12-14 over analogue in the same 30kHz bandwidth.

In the fixed wireless local-loop situation, the results are quite dramatic, since highly directional antennas can be used (as they can with all technologies). And so where analogue AMPS was able to provide, on average, 41 voice channels per cell (5MHz with N=4 reuse), they claim 568 for E-TDMA. That's what Hughes claims, anyway.

Stewart Fist

telecoms-watcher that the technologists are all suffering terminal cases of over-enthusiasm and considerable lack of judgement about the problems they are likely to experience. Virtually all these new systems are also evolving at about twice the electronic complexity of the original proposals, which is a bit of a worry.

At the same time, the additional complexity won't necessarily mean additional cost in the handsets and vehicle units. The chip makers and designers and, in particular the digital signal processing (DSP) sector of the chip industry, has advanced remarkably in this two year period, and so the early units are probably smaller and cheaper than projected. The first handset designed for GSM, for instance, was nicknamed 'The Brick' because of its anticipated size — but the first GSM handsets now being released in Europe and Australia are certainly equal in size to their analogue counterparts.

But price is a different matter. Generally, when a new technology is introduced into a new market, the manufacturers jack-up the price to rip off the first-adopters, and then later drop their prices to a more reasonable level after the suckers have been satisfied. This is the standard way to pay off the R&D quickly, but still reach out into new and more discerning markets.

But in Europe, the opposite appears to have happened. Motorola jumped into the German market with a low-priced GSM handset which stuffed up the release plans of Nokia, Ericsson, Siemens and Alcatel. Some complaints were made that Motorola was releasing mobile equipment at below production-cost — one informant used the term 'dumping' — but I'd translate this as meaning 'below the agreed cost.'

Whatever happened, Motorola certainly grabbed up a sizeable chunk of the German GSM market, to the chagrin of the European companies which had done the bulk of the development work. As a result, some Europeans were forced to change their release plans at the last moment, and the roll-out of handsets was delayed even further.

I doubt that this price-drop will happen in Australia. Nokia's new GSM 1011 portable has just been released here at a recommended retail price of $2,400, so I guess it plans to clean up in the colonies. But at least this profit-motivated surge of interest might overcome some of the early suggestions that we'd be starved for handsets until the European market was satisfied.

The type-approval fiasco (from a mandatory 600 tests, to 266 tests, and then 160 tests) had already set handset manufacture back by close on a year. It hasn't been loudly trumpeted by the manufacturers, but virtually all of the first run of mobiles failed the 160 interim test standards and had to go back to the design-board for modification. Heaven knows what would have happened if they'd done all 600 tests.

The German Question

In Europe, the German digital telephony industry is the lone success story in GSM at the moment — the Germans have two networks, each with 600 base stations, many of which, according to past report, have been in place for nearly two years. Various uptake figures are quoted (many obviously fictitious) but according to Frank Zeichner of Alcatel, it appears that sales in Deutschland have reached the 170,000 mark — 20

GSM — Better Late Than Never?

After an embarrassing delay, Australia has now entered a new era in mobile communications. In the first part of an extended look at digital mobile technology, Stewart Fist examines GSM's status.

March '93 was quite a month for mobile telephony. There was a Pan-Asian GSM Summit in Hong Kong where the UK Department of Trade finally caved in and allowed both Australia and Hong Kong to get the A5 encryption chip — on the condition that no GSM handsets ever crossed the border into China! Someone really had their tongue in their cheek there, didn't they?

About the same time Australia was launching, then not launching, then launching again the system after a last-minute discovery that the spooks couldn't listen in. But much less publicised was an event taking place in the US, which, I predict, will have far more impact on mobile telephony than anything we've seen in the last half-decade.

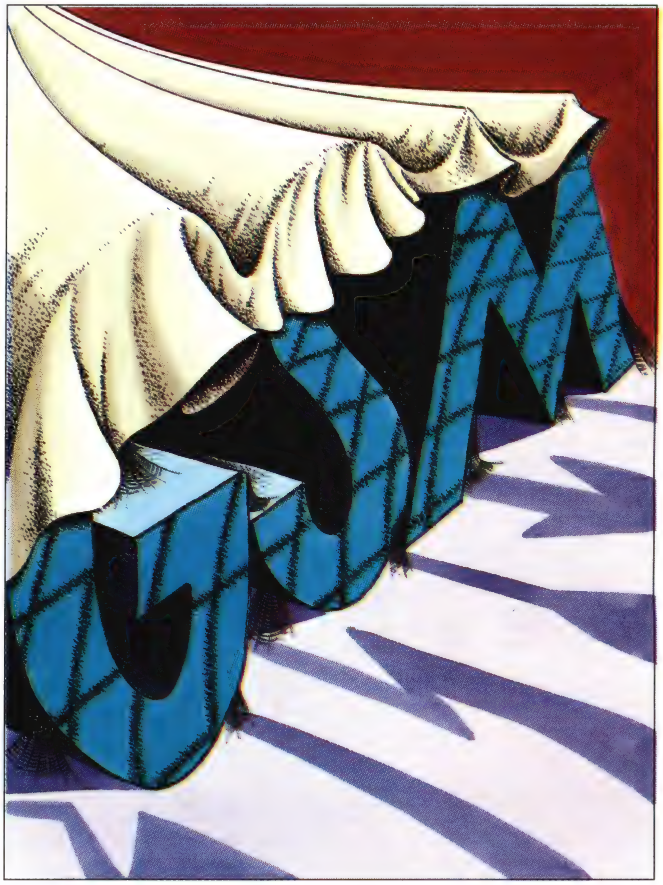
This was the official launch of Code Division Multiple Access (CDMA) mobile telephony at a symposium organised by Qualcomm, PacTel, US West and GTE Mobile in San Diego — and with enthusiastic participation from Bell Atlantic, Ameritech, AT&T, Motorola, NorTel, Oki, Nokia, Canada's Bell Cellular Mobile, Nynex and assorted others. I've listed them in full, because the impression has been created in Australia that the world battle for the mobile market is between Europe's GSM and its derivative DCS-1800, and America's Time Division Multiple Access (TDMA, which we call Digital AMPS or D-AMPS).

My guess is that Qualcomm's CDMA is the 'Apple II' of the mobile world — seen by many to be a crazy, wishful dream of a little start-up company — but now set to jump onto the world stage and blow the big-iron out of the water.

This sticking-my-neck-out-prediction is just to whet your appetite for Part 2 of this article, which will appear in next month's edition of *Australian Communications*. This month I'm going to concentrate on GSM, with a brief mention of D-AMPS and the range of other American TDMA-derived technologies. And since I can rely on Telecom, Optus and Vodafone to heavily promote the positive values of GSM, ad nauseam (and there are many — in the long-term) I'm going to play devil's advocate here and give you mainly the downside of the technology. This is the stuff that you won't read in the $20 million mobile advertising campaign that's about to descend on us.

Hong Kong Headaches

Participants at the Hong Kong Pan-Asian GSM Summit came away with contradictory impressions as to the progress of the new European digital telephone technology. Generally most of them were astounded at the immaturity of the system, given that Australia was within weeks of introducing it — and also given that GSM was already delayed by two years.



GSM isn't the only new telephone technology to suffer these delays of course. DECT (Digital European Cordless Telephony), D-AMPS, JDC (Japanese Digital Cellular), MobileSat (the Aussat/Optus satellite mobile system), Britain's CT-2 (Cordless Telephony 2) and Ericsson's CT-3 (a digital PABX system) have all suffered two and three-year introduction delays, which must suggest to any

Inside GSM

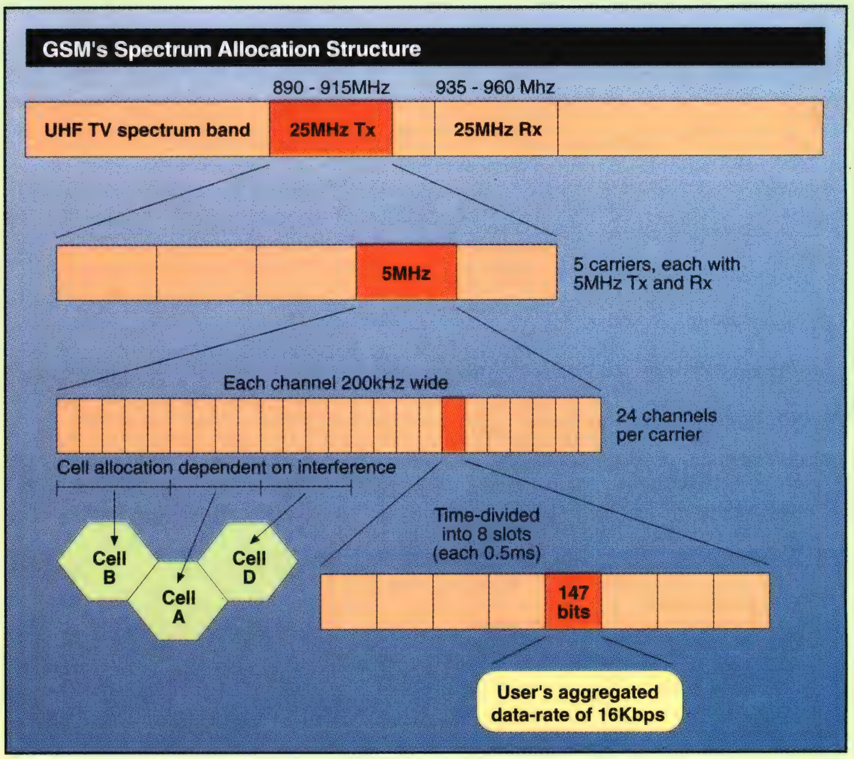
At the top of the list of requirements when GSM was first mooted was the need for increased capacity in the given bandwidth. And the best way to do that at the time was to define a number of narrow frequency bands, and time-divide each of these into a number of slots (short burst periods). This, in practice, gave them about three times the capacity of the same frequencies used for analogue mobile.

GSM ended up with a standard spectrum allocation of 25MHz (890-915MHz) for the mobile transmitters, and another 25MHz (935-960MHz) to receive. Each of these major bands is then further divided by the regulators into five-5MHz chunks, and one each of these (a Tx and an Rx) is allocated to a carrier. We only have three GSM carriers at present, but space is being left for five.

This twin-25MHz way of dividing up the spectrum is standard for GSM, so handsets bought in any country should work in Australia.

Within their 'twin-5MHz' of bandwidth, each carrier will then allocate a different frequency range to different cell base stations, since adjacent stations cannot use the same frequency. This subdivision is known as the cell-reuse factor, and on average, each cell has one-fifth to one-seventh of the available bandwidth — but this is variable and depends on the propagation conditions of each individual cell. The only criteria is that the signals from one cell must not interfere with those of another.

At the cell level, the available bandwidth is then divided into channels, each 200 kiloHertz wide — there's a total of 124 channels in the 25MHz of the band — which is 24 to each carrier. This is the full extent of the frequency division (FDMA) allocation, so there is, on average, about three to six channels available at each cell. Each channel is then subdivided in time by allocating eight users a single time-slot each in a channel, in strict rotation — giving them a total of just over 16 kilobits per second each, but in bursts. These slot-bursts are relatively short, about half-a-millisecond — and the transmitter can cram about 147 usable bits into each time-period.


GSM's Spectrum Allocation Structure
890 - 915MHz
935 - 960 Mhz
UHF TV spectrum band
25MHz Tx
25MHz Rx
5MHz
5 carriers, each with 5MHz Tx and Rx
Each channel 200kHz wide
24 channels per carrier
Cell allocation dependent on interference
Cell B
Cell A
Cell D
Time-divided into 8 slots (each 0.5ms)
147 bits
User's aggregated data-rate of 16Kbps

Voice is digitised and fed through a RPE-LPC (Regular Pulse Excited — Long Term Prediction) vocoder which generates 'descriptions' of the voice as well as sound patterns — so this is best characterised as half sound-encoder/half voice-synthesiser — and it creates a data-stream 13Kbps wide. This, together with about 3Kbps of signalling and control, then makes up the 16Kbps slot-bandwidth.

This sound-data is transmitted, interleaved with the controls, back to the base, where it is transcoded into 64Kbps PCM or analogue, and sent over the wires.

As with other forms of mobile telephony, GSM is supported by a very complex array of location registers (databases) which keep track of its position, intelligent switch-complexes to perform the hand-off functions, and a range of other support and authentication services which ensure that the system operates efficiently, and that the carrier gets paid.

The fact that the system is fundamentally digital inspired the designers to add a number of facsimile, paging and data-transport features, although most of these seem to have run into trouble, and will only be available later. The network side of GSM is based on ISDN protocols, and the signalling has been closely aligned with the standard digital packet-switched CCS#7 signalling protocols.

Stewart Fist

to 30% above expectations — in only a few short months. Mind you, Germany had a particularly poor analogue phone system, and the East Germans need mobiles just to bypass their antiquated wire-line network.

Reviewing the general take-up of GSM in other European countries, Ed Hofstra of Motorola said at the Hong Kong conference: "Others will deploy GSM at a much slower pace, mainly for roaming purposes. They have limited large-scale deployment plans for the immediate future."

Sweden and France are seen as being the second-rung introducers — Sweden, because everyone including school children carries a mobile phone, and France, because analogue users have had to endure high mobile costs for many years, so digital may appear to be cheap. There are now about 10 countries with international roaming agreements and interconnections in place. A special 'Clearing House' needs to be established for payment, and they've got to develop a special administration organisation to settle disputes. International roaming is implemented through bi-lateral agreements.

The GSM Memorandum of Understanding (MoU) which has been signed by 25 countries (17 in Europe and eight in the rest of the world, including Australia) includes a clause stating that each country would guarantee to provide a core number of base stations for the international roamers, covering mainly international airports, highways and the city centres.

These were generally engineered to the minimum-required level during the trial period, and some incipient networks have since been upgraded substantially — but the drive to provide blanket coverage has certainly lagged well behind expectations. Carriers don't particularly like the idea of internal competition — with digital competing with their current analogue systems — unless analogue has been pushed to the limits.

Disappearing Dreams

The MoU has often been misinterpreted to mean that a promise exists to allow manufacture of GSM equipment in all signatory countries, but this is not even half-right. The MoU is between carriers, not between manufacturers — the hardware people were specifically excluded from these meetings.

There was an early assumption that all participants in the original GSM design would throw their relevant patents into a pool, from which any MoU-based manufacturer could draw. But the pool idea never eventuated, and so patents are now exchanged and licensed between manufacturers on a one-to-one basis, leaving the smaller European and the non-European companies (with the exception of Motorola and NorTel who have important patents) out on a limb. The best that Australia can expect is to be permitted to assemble products under licence from one of the main players, like Nokia. Australia's hopes of becoming the GSM manufacturing centre of Asia now seem like futile dreams.

Many of the other dreams of GSM evaporated also (some perhaps only temporarily) as the delays piled up. The complexity of the system reached crisis point a few years ago when a forced decision was made to divide the release of the technology into Phase 1 and Phase 2 — and since that time, Phase 2 has slipped back in expectations until mid-1995 or maybe later. If you are waiting for data services over mobile telephony, you've got a few years more of waiting yet.

The Americans have experienced similar problems. Their carriers are loudly complaining about the lack of movement on the definition of data-protocols for D-AMPS, and of the poor voice-quality of their new digital voice. You'd hardly know from the literature that there are at least six D-AMPS services being trialled around the world, including one in New Zealand.

Digital Problems

Some major problems with digital telephony stem, it seems, from the high data-rates and extremely fine timing requirements associated with the use of time-division (TDMA) in mobile systems. When a given bandwidth is divided into time-slots (3 for D-AMPS and 8 for GSM) then the cumulative data-rate is very high and the synchronisation of transmission bursts from the mobiles becomes critical.

These are problems associated with the slow speed of light and EMF waves relative to the high data-rates, so they tend to effect GSM more than the American D-AMPS (which uses a narrower carrier bandwidth and a lower data-rate). When a GSM mobile is 35kms from base and another is close by, the difference in propagation delays between the signal paths is equivalent to about half the allocated time-slot (0.577ms or 156 bits) in length. So if incoming signals from the near and distant mobiles aren't to collide, then each of the distant mobiles must be instructed to advance its transmission frames to compensate for the distance.

This propagation delay is monitored at the base, and instructions for synchronisation advancement are sent back to the mobile. But this is not possible for the first 'access burst' which the mobile transmits initially to request a channel allocation — so the access burst has been defined to only use the first half of a slot. That way it can't overflow into a slot used by another mobile. This is, in fact, what sets the limit of the GSM cell size.

In Australia, Asia, Africa, some parts of the USA, Canada and South America, it became obvious that 35km cell diameters were not going to be adequate to provide coverage in the more sparsely settled regions of territory. This wasn't foreseen as a problem when Australia first chose GSM for some reason (although it occurred to the technocrats later) which is why they reduced national-coverage expectations and promoted the idea that GSM was for the 'urban environment only.'

They can now drop this line of post-hoc propaganda; fortunately a way around the problem has now been devised, although the proposed 'patch' won't be implemented for some time. It is now being suggested that these outback bases can 'slot-steal' by only allocating every second slot to users. With a full slot of 'guard band,' more distant mobiles can now transmit to base without the risk of interfering with others — they will overflow only into unused slots.

Capacity is generally not a problem with these wider outback cells.

There have been a couple of notable changes to the base technologies and standards in the last couple of years. Frequency hopping is now optional rather than mandatory at the base station, but it is a mandatory function in the mobile. This ability to have the unit automatically hunt around the spectrum and choose a frequency with less interference is one way to improve average voice quality and reduce interference and shadow effects.

They also use a transmission scheme with voice activity detection (VAD) to turn down the transmission power when the user isn't speaking and so reduce interference across the signal range as a whole. They call this discontinuous transmission (DTx) and it has the secondary affect of saving battery life. But, in turn, DTx adds to complexity by needing 'comfort noise' to be inserted into the receiver circuits to remove the disconcerting on-off background feedback from the transmission channel. Interference is not much of a problem at this early stage of GSM introduction, of course, but it will get to be a problem later when traffic load rises.

One problem experienced with the DTx is that the voice will often appear to be 'clipped,' and this is also very obvious in the D-AMPS trial videotapes I've heard (they use a similar approach). Voice clipping gets to the stage of being quite disconcerting, but it is needed to maintain the capacity-gain claimed for digital over analogue — a capacity gain that has already been drastically reduced when you compare test results with the early expectations.

This technique seems also to have introduced some problems when the units are used for modem-based fax and data transmissions — fax/data signals need to be detected and assigned to a special channel-type.

As Alcatel's Frank Zeichner explains, "There was a bit of a problem in working out some of the signalling for alternate fax/data type services — especially for switching back and forth between data and voice." Remember: the ISDN-like ability to send simultaneous voice and data was one of GSM's early promises.

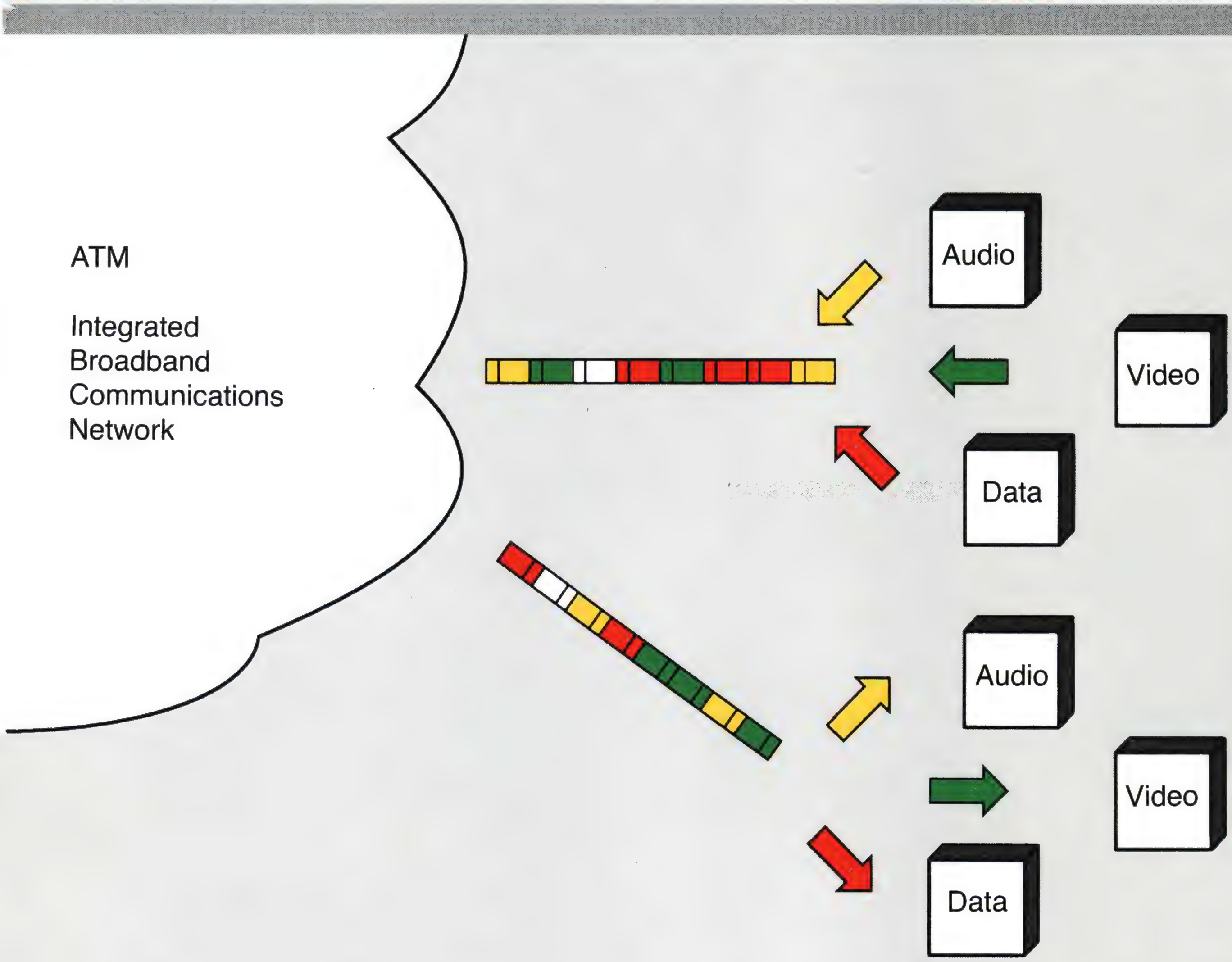
In the wire-line network, GSM was designed to interface with ISDN circuits for on-carriage, but it also needed to work with analogue PSTN circuits since digital channels aren't yet universal. Echo cancellation in these circuits has proved to be essential, and so special channels must be provided with permanent cancellation in place. The management of the signalling was also designed around short-messaging over packet-switched CCS#7 and ISDN D-channels, but in analogue countries another way had to be found around this problem.

The Short Messaging Service (SMS) which allows two-way messaging up to 160 characters in a pager-like operation, has also been delayed around the world, although it now appears likely to be implemented in current networks — at a sort of Phase 1.5 stage. Telecom Australia says that it will be in Australia later in the year — but its got to build a message-handling facility first.

Central to the GSM mobile system is the MAP or Mobile Applications Part which is a GSM-specific protocol, riding on the back of CCS#7; it carries all the authentication and identification information. Currently we are using an interim Version 1 of MAP, and the new Version 2 will come with the Phase 2 changes in mid-1995.

According to Kari Marttinen, Finland's Chairman of the GSM MoU, "The implementation of second-phase networks would probably not be such a difficult task, if they were to be built from scratch. Unfortunately the upgrading of Phase 1 to Phase 2 will involve improvement of almost every single part of the whole system. At some point all different versions of these 'modules' will coexist in the market, resulting in a high variety of call and network combinations." Not an attractive prospect!

Are you prepared?



User demands on digital networks are expanding at an unprecedented pace for services such as data, speech, text, video conferencing and high resolution TV. This requires a single integrated multi-purpose network with transmission rates exceeding 100 Mbit/s.

CCITT set recommendations for the solution – ATM (Asynchronous Transfer Mode).

The European Community set up a major telecommunications Research and Development programme into ATM (RACE). Wandel & Goltermann was selected as the project leader for test and evaluation equipment (PARASOL). This close relationship with Telecommunications Carriers, System Manufacturers and Standards Organisations such as CCITT and ETSI has assured that Wandel & Goltermann is at the forefront of this technology.

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Urban Myths

A year or so ago when I first wrote in these pages on GSM (see 'GSM — Why are we Rushing to Embrace it?' *Australian Communications*, February 1992), I commented bitterly on the fact that field-test results were not forthcoming from the various European service providers, and that the shelves were bare when you wanted to find out about lab trials and how well the technology worked in practice.

The shelves are still bare, although Eric Kwan of Telecom did outline Telecom's trial findings in Hong Kong — and more recently a few pages of trial-conclusions fell off the back of a truck in London and found their way into my mailbox.

Telecom's information was lukewarm to say the least, although they are obviously going ahead with promoting the system. They concluded that:

- The system works well and hand-offs are reliable while the signal is good;
- Speech quality is superior but may deteriorate rapidly at coverage boundaries;
- The range coverage and time-delay dispersion effects are in line with the R&D predictions, hence are manageable;
- There are many 'leverages' that can be used in the control of the radio environment; [however] there is still much to be learned;
- Certain unacceptable interferences have been experienced from mobile terminals; and
- Initial software instability for base stations has been experienced in the Sydney trial.

The 'certain unacceptable interferences,' refer to stories that have been circulating for some time that GSM causes problems with nearby cardiac pacemakers, cochlea ear implants, and hearing aids.

The idea of a ward full of pensioners passing away when you take an incoming call at the nursing home is more than a little disturbing. So I contacted Greg Strain at Bionic in Lane Cove, the Australian (and world) experts in such devices, and asked them to check their literature for details of any confirmed catastrophes — and after a couple of days of (rather panic-stricken, I would guess) checking around the world, he came back with the news that the supposed problem was most likely to be an urban myth. He had figures on the signal strengths needed — and the calculations seemed to be well out of any reasonable parameters.

So I accepted his assurances, until the Australian Government's hearing aid laboratory went public with the news that it had been having problems with digital phones emitting strong signals in the 500Hz region. I'm thinking seriously of reviving the chain-mail body-armour business for ex-heart attack victims. It could be a thriving (or dying?) business.

The other rumours — about aircraft navigation systems and computerised manufacturing lines going haywire — are almost certainly urban myths, but . . . ?

The London information echoes many of the points made by Telecom, but it suggests that 'subjective' user-trials don't find noticeable improvements in voice quality over analogue, and says that emphasis should not be placed on this aspect in GSM marketing. "Many participants preferred the sound of the analogue system, despite more noticeable static," it said.

Another important comment from the London trial was that GSM suffers a staccato-like drop-out in narrow streets and at the outer reaches of cells, when driving down 'foliage tunnels' (overhanging trees) — especially in the morning when the trees are damp from overnight frost, during and after rain. I guess this is more likely to be a problem in Europe than in Australia — and it is one that seems to be intrinsic in TDMA digital systems. However it does raise a question as to how effective the half-rate 1.8GHz version of GSM (DCS 1800) is going to be as a local-loop substitute.

The London trials also found that in-building reception was highly variable, probably due to the Rayleigh-fading (time-delay dispersion) effect when signals are bouncing off nearby walls and metal furniture. Generally, GSM appears to be roughly equal to analogue in overall voice tonal-quality and intelligibility when close to the base station, and slightly below it when the signal is weak, either through distance or being blocked by buildings. But this could be assisted by increased base station power. D-AMPS has proved to be much the same, but American users are more critical about the 'metallic' tone of the voice.

The capacity increase supposedly inherent in changing from analogue to digital telephony is much harder to estimate with GSM, or to compare with the American approach. GSM uses new frequencies, so Australian and European digital capacity is built on top of the existing analogue. But D-AMPS was specifically designed to reuse some of the analogue spectrum, and so it steals some capacity, then gives it back through a 3x multiple reuse.

Some of the early information on GSM has suggested that capacity-gain per MegaHertz of bandwidth was about 3-times, although both 4-times and 2.5-times have been bandied about. The odd figures are due to the fact that the location-specific cell reuse patterns are as important here as the time-division gain achieved by allocating 8 two-way conversation-slots within the set 25MHz of bandwidth.

Waiting For Phase 2

In the current version being introduced around the world, the digital phone system has been severely cut back to a minimum, and most of the goodies will come later with Phase 2. At present we have a basic mobile telephone, some emergency services, and some basic intelligent network services like Call Forwarding. There's also international roaming in Europe.

Bernard Mallinder of BT Mobile Communications, says that "It is likely that some early Phase 2 systems will emerge during 1996," — which is a little bit more pessimistic than the mid-1995 date now being touted about.

This new GSM Phase 2 will include those specifications applicable to both 900 MHz (GSM) and 1.8GHz (DCS 1800) networks, and thus merge both into a common standard. Half-rate code specifications for GSM will be available in early 1994, and these may be introduced into existing networks before Phase 2 is officially launched. All new Phase 2 half-rate handsets will need to handle full-rate as well, because the user can't depend on the various networks to be 'phase independent.' Some will introduce half-rate, and others won't.

The new 1995-6 Phase will provide multi-party links and closed user groups — in effect, virtual private networks (VPNs) for mobiles. Packet mobile services and the support of special Road Transport Information (RTI) services such as SOCRATES will come towards the end of Phase 2. These involve using the network to broadcast road conditions, etc. to mobiles in a cell area, and must be user-selectable so that people are not flooded with unwanted messages about traffic conditions, for instance, when they are at home.

Phase 2 will introduce new testing and type-approval problems also; it is a superset of Phase 1 but with 'additional services and features' which don't exist now. In order not to frighten the natives, the MoU group has decided that 'there will be no Phase 3,' but work has begun on future enhancements referred to as 'Phase 2+' — such is life!

A new testing methodology, including the TTCN (Tree and Tabular Combined Notation) description language is also currently being introduced, but it was not available for GSM Phase 1. One Hong Kong speaker warned that "The impact of using it for GSM Phase 2 will [need to] be assessed in terms of additional costs and delays before any decision is taken in this respect."

Given the delays introduced by even the cut-down GSM Phase 1 testing procedure, the need to retain Phase 1 compatibility, and the problems that must arise through slight variability between existing cellular mobile and base station implementations, it looks like there may be even more introduction problems ahead.

Stewart Fist is a freelance journalist based in Lindfield (NSW).

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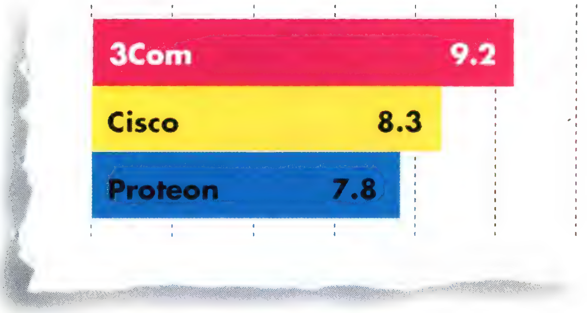
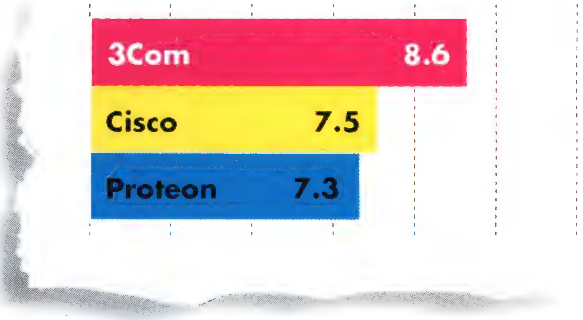


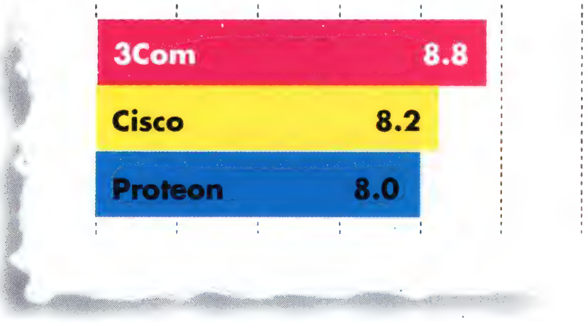
In a recent Buyers' Scorecard Survey by Computerworld *magazine, network managers rated leading bridge/routers. 3Com's NETBuilder® was rated Most Reliable, ahead of the market leader.*

Responsiveness of vendor service



In fact, NETBuilder got the highest ratings in 11 of 14 categories. That included Value, Physical Design, and Responsiveness and Quality of Vendor Service and Support.

Performance



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Inside Microsoft's Windows NT

With Windows NT, Microsoft hopes to leverage its PC operating systems dominance into control of the network. But can the software giant make the jump from the desktop to distributed computing?

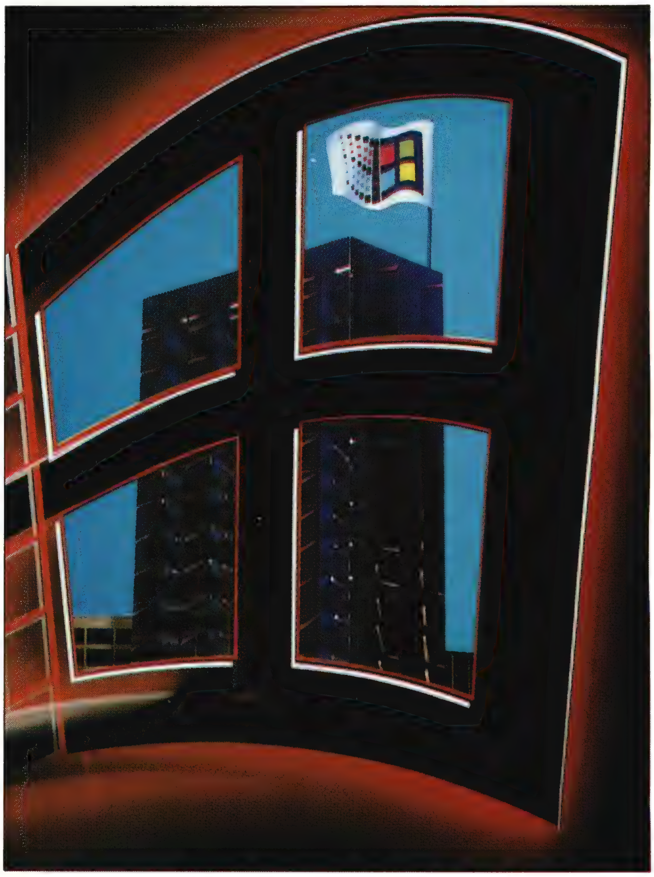
To those charged with implementing mission-critical applications, Microsoft is one big contradiction. Windows may be the overwhelming favourite of end-users everywhere, but experience has taught IS personnel to view the operating environment as an accident just looking for a place to happen. The software's notoriously tough to network, lacks true multitasking, and doesn't play well with communications software — and that's just for starters. Factor in Microsoft's penchant for proprietary technology and buggy first releases and then total up the time wasted waiting on hold for tech support, and it's easy to see why net managers get that worried look whenever the company's name is mentioned.

Now that Windows New Technology (NT) is on the way, much of the IS crowd seems to be in denial. Some are hoping that Windows NT will just go away: others are counting on Microsoft's tradition of lacklustre first releases and figure they've got nothing to worry about for the time being. Wrong on both counts: Bill Gates and company have made it clear that they're going after the distributed applications market with the same intensity they've brought to just about every other business opportunity. And this time out, Microsoft looks to be taking a textbook approach to distributed computing.

Unlike the company's previous operating systems — including DOS, OS/2, and Windows — Windows NT is a 32-bit OS designed from the ground up as a platform for networking: file and print sharing are built in, as are APIs (application program interfaces) for NOS vendors looking to build client software, TCP/IP support, and RPCs (remote procedure calls) for interprogram communications. And the vendor is taking pains to make Windows NT portable, reliable, secure, and scalable — in short, attending to all the attributes demanded by distributed computing.

Windows NT signals another first for Microsoft: support for standards. The US Government's Posix (Portable Operating System for Interactive Executives) is part of the OS; and get this: Microsoft has even defined an SNMP MIB (management information base) for Windows NT. Users can thus plan on employing their favourite SNMP management system to monitor Windows NT servers, right alongside bridges, routers, hubs, and other network equipment.

What all this means is that Microsoft is serious about moving beyond the desktop (which it virtually owns) into territory now controlled by systems vendors. Windows NT is just part of its master plan. The company also is working on other offerings, including electronic-mail programs, the Microsoft API (MAPI) for mail-enabled applications, and software and APIs for its Open Database Connectivity (ODBC). And the vendor also is moving beyond its Intel-only restriction. DEC intends to sell Windows NT as an alternative to VMS and Unix for its Alpha workstations and servers.



Whether Microsoft can accomplish its ambitious goal is a different story. At the time of writing, Windows NT had yet to ship, so it's a bit early to predict success or failure. Microsoft seems to be listening to the marketplace and addressing weaknesses of

Operating Systems: An Overview

ATTRIBUTES AND FEATURES	WINDOWS NT	NOVELL UNIXWARE	IBM OS/2	MICROSOFT MS-DOS
Multiuser	No	Yes	No	No
Multithreading	Yes	Yes	Yes	No
Multiprocessing	Yes	Yes	No	No
32-bit Addressing	Yes	Yes	Yes	Partial
Scheduler	Simple	Complex	Simple	None
Graphical User Interface	Windows	X-Windows	Presentation Manager	Windows
Network Management	SNMP	SNMP	SNA	No
TCP/IP Support	Yes	Yes	Optional	Optional
Network Client	Yes	Yes	Optional	Optional
File Server	Yes	Optional	No	No
Posix API	Yes	Yes	No	No
C2 Security	Yes	Yes	No	No

earlier products and architectures. Still, it's unrealistic to expect any vendor to hit the nail on the head in the first release of such a complex product. Indeed, an extensive hands-on review of a beta release of Windows NT shows just how far Microsoft has to go in order to ship a viable product. And Windows NT faces stiff competition. IBM is pushing OS/2; Novell is touting Unixware (its version of Unix for Intel platforms); and Sun Microsystems is singing the praises of Solaris (its version of Unix for Intel machines).

One thing is clear: Windows NT merits serious attention from anyone implementing distributed applications. And that means that things have just gotten a little more complicated for IS managers trying to decide on client-server software for their corporate networks.

First Impressions

For all that's new about Windows NT, onscreen it's a lot like Windows 3.1 — hardly surprising since the two user interfaces are virtually identical. But that's the end of the similarities. Essentially, Windows 3.1 is an add-on application manager for 16-bit, single-user DOS. Windows NT is a multitasking, multiprocessing operating system.

Further, Windows NT is a multithreading OS; it divides tasks into multiple threads (streams of instructions) that run concurrently. This improves the performance of database and transaction servers. It is also a pre-emptive operating system — which means that Windows NT, rather than a program running under it, decides when to interrupt a task.

Windows NT is based on a microkernel architecture. In essence, NT Executive (the core OS) has only those functions needed for low-level processing, such as managing access to main memory, calling local procedures, and overseeing I/O. Windows NT also includes a Hardware Abstraction Layer (HAL) that isolates most of the OS's hardware-dependent code, making Windows NT fairly simple to port.

With a microkernel architecture, add-on software modules handle the higher-level processing. Thus, it's relatively easy to extend system functions. Older operating systems like VMS and OS/2 are typically harder to extend, since their cores include a range of low- and high-level functions.

The modules that Microsoft will supply with Windows NT can be classified as clients or server subsystems. They take care of everything from user log-ons to ensuring compatibility with other OSs. The Win16 client, for example, consists of Windows applications running under Windows NT, as well as the Dynamic Link Libraries (DLLs) that the application calls. The Win16 client interacts with a DOS server subsystem, which in turn communicates with the Win32 subsystem. (Note that almost all the Windows NT subsystems communicate with Win32, which acts as an intermediary between them and the microkernel, delivering some services on its own and access to other system services.)

The microkernel approach does exact a price, though. The minimum system configuration for Windows NT is a fast 80386 PC or a 80486 machine, 8 Mbytes of RAM, and 80 Mbytes of disk space. That makes it about three times larger than Windows 3.1 and comparable in size to OS/2 and desktop Unix systems like Solaris and Unixware.

Networking is the essence of the Windows NT design. The OS contains almost everything needed to support both clients and servers. For one thing, nearly all the functions of Microsoft LAN Manager have been built in. The earlier version of LAN Manager, which runs under OS/2, delivers file and print services, along with management features that make it possible to set up user accounts and assign security rights. Beyond that, LAN Manager for NT also can simultaneously manage multiple servers (or domains). And Microsoft has indicated that LAN Manager for Windows NT will support the redundant arrays of inexpensive disks (RAIDS) often used in servers. (For the record, Microsoft intends to keep selling LAN Manager as a separate product.)

The APIs, redirectors, transport drivers, and other network components internal to Windows NT use well-defined, standard interfaces, This allows them to be mixed and matched dynamically, a capability that should be much appreciated by IS managers trying to establish distributed applications that work with the wide variety of servers and clients already in place on their networks (see 'Opening Up Windows NT' on page 84).

Applied APIs

Windows NT also features APIs that allow NOS vendors to write client software that will run with the Microsoft OS. This is good news for users of Novell's NetWare and Banyan's Vines, as well as other network operating systems. Novell has already announced that it will ship client software for Windows NT at about the same time that Windows NT itself is delivered.

TCP/IP also has a place in the base operating system. The beta release of Windows NT includes a TCP/IP protocol stack and TCP/IP client applications like Telnet and FTP (file transfer protocol). TCP/IP routing is supported as well, so Windows NT can shunt data from clients to remote servers. Microsoft's router will be useful where traffic levels don't justify standalone products.

Unfortunately, Telnet and FTP server applications were not part of the Windows NT beta release. And an implementation of the Network File System (NFS) — the industry standard for servers that must communicate with Unix clients — was also missing. The omission of Telnet and FTP renders Windows NT ineffective as a server for Unix workstations, so it's a good bet that Microsoft will add these functions in the future. NFS support will probably be furnished both by Microsoft and by third party add-ons, as it is with other OSs including Unix.

Microsoft has made sure that Windows NT will ship with an RPC that lets applications invoke programs or services residing on remote machines. RPCs, especially the one contained in the Distributed Computing Environment (DCE) from the Open Software Foundation, are emerging as the preferred method of communication for multivendor distributed applications.

Although the RPC that comes with Windows NT is equivalent to DCE's, Microsoft chose not to use OSF code. Instead, it created its own RPC using the DCE specification. Most likely, the vendor felt the OSF's licensing fees were too high for a mass-market product. And Microsoft probably felt that all the functions of DCE weren't needed.

By supporting SNMP, Microsoft is making sure that its OS can send network management information to a management station on a TCP/IP network. Windows NT returns information that the station requests about a network device using MIB II objects Microsoft has defined. For instance, by requesting an object called svStatQueuedJobs, a management station can determine the number of jobs queued for printing on a server. The complete list of objects Microsoft has defined can be found in the documentation for the Windows NT software development kit (SDK).

Taken together, the foregoing is an impressive start on an OS for distributed applications. But Microsoft has no intention of standing still: In the next year it plans to introduce a series of system management products — identified by the codename 'Hermes' — that will oversee hardware and software inventories, handle software distribution and installation, and meter application usage.

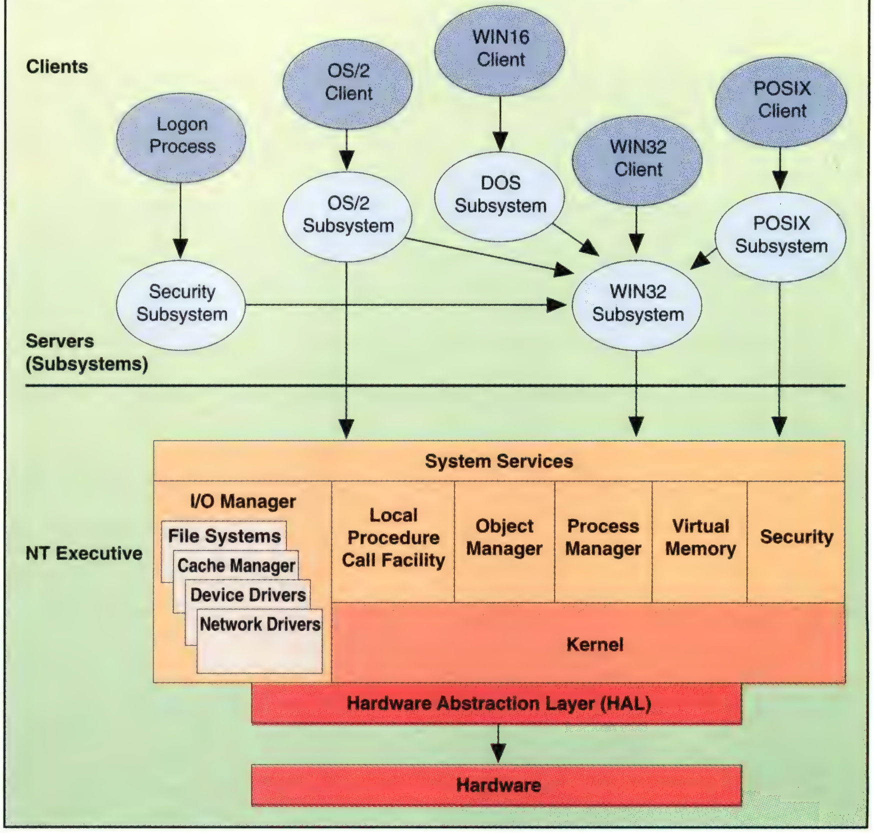
Among other things, Hermes will let system administrators opt for either a centralised or a distributed approach to management. It also will deliver many of the functions being evaluated for the OSF's Distributed Management Environment (DME). Whether Hermes will be compatible with DME remains to be seen, but the products are expected to work with most Microsoft systems software, including Windows NT, LAN Manager, Windows, and DOS.

For all its promise, though, Windows NT does have some glaring shortcomings. Microsoft will surely come in for criticism for not building in support for dumb terminals. In addition, there's no way to cluster multiple Windows NT servers more tightly than is possible with common network protocols like TCP/IP or NetBIOS. If it were possible to accomplish, such clustering would be similar to the approach taken by DEC with its VMS minicomputers and workstations.

Microsoft may remedy these shortcomings on its own or leave them to third parties. The second alternative may prove worrisome to traditional IS managers who are used to the one-vendor/one-product-does-it-all approach. Still, Microsoft's roots are in the PC world, where third-party enhancements are commonplace.

In the Beginning

Work on Windows NT began in October 1988, when Microsoft hired David Cutler from DEC as Director of Windows NT Development. Cutler's resume includes several OSs built for DEC, and he was working on a portable version of VMS when he left.



Windows NT: Inside and Out

The microkernel approach taken with Windows NT puts only those functions needed for low-level processing in the core OS (NT Executive). The Hardware Abstraction Layer isolates most of the hardware-dependent code, making Windows NT fairly simple to port.

Cutler argued in favour of going well beyond the portable version of OS/2 Microsoft was studying when he came on board. The company bought into his vision and decided instead that its new OS would deliver all the essential attributes needed for distributed applications. That was a tall order, since it meant that Windows NT would have to be portable, reliable, secure, compatible, and scalable.

Portability was achieved in part by writing most of the OS in C and C++, both portable languages. Further, a Hardware Abstraction Layer (the aforementioned HAL) is used to isolate most of the hardware-dependent code used in Windows NT. In essence, HAL furnishes software routines that provide high-level access to interrupts, timers, cache coherency, and symmetric multiprocessing. If the OS is ported to another platform, the software routines can be rewritten, which is a lot simpler than rewriting the assembly-language programs specific to a particular microprocessor. And even though not all of the OS's hardware-specific code is contained within HAL, early word from developers is that Windows NT is at least as portable as most flavours of Unix.

Microsoft intends to take full advantage of Windows NT's portability. It will offer the operating system for Intel's 386, 486, and Pentium processors, as well as for DEC's Alpha processor. The company also is selling Windows NT for the R4000 from MIPS Computer Systems, which is used in workstations from Silicon Graphics and other vendors. DEC will also sell Windows NT, as will other workstation suppliers.

If an operating system is to be trusted with mission-critical client-server applications, it needs to be reliable. With Windows NT, Microsoft is eager to improve the notoriously low level of integrity offered with DOS and Windows. The new OS puts each application into a separate address space. This prevents ill-behaved programs overwriting one another and crashing the system. True, if an application does something illegal, like accessing out-of-bounds memory, it's possible to end up with the equivalent of Windows' all-too-familiar 'Unrecoverable Application Error.' But with Windows NT, the damage will be restricted to the offending user applications rather than bringing down the entire OS.

The NT File System (NTFS) also contributes to reliability by supplying a journal of file changes and enabling automatic recovery after a crash. Disk mirroring and duplexing also contribute to data integrity.

Windows NT also features structured exception handling (routines that allow normal

Opening Up Windows NT

To accommodate multivendor computer networks, state-of-the-art operating systems must support multiple protocols, APIs (application program interfaces), and redirectors (software that redirects service requests from applications out over the network). The only efficient way to implement all the foregoing is with well-defined interfaces between components. Microsoft is doing exactly that with Windows NT, implementing its own Transport Driver Interface (TDI), Streams, and the Network Device Interface Specification (NDIS), among other interfaces.

When an application needs to communicate with Windows NT, it uses one of the operating system's many APIs. These include RPCs (remote procedure calls), standard I/O facilities in different programming languages, Winsock (for TCP/IP applications), and Wnet. Wnet is a new API Microsoft has created; it's intended for things like file browsing across a network.

Alternatively, applications can be written directly to NetBIOS, which is supported in Windows NT's implementation of NetBEUI (NetBIOS Extended User Interface).

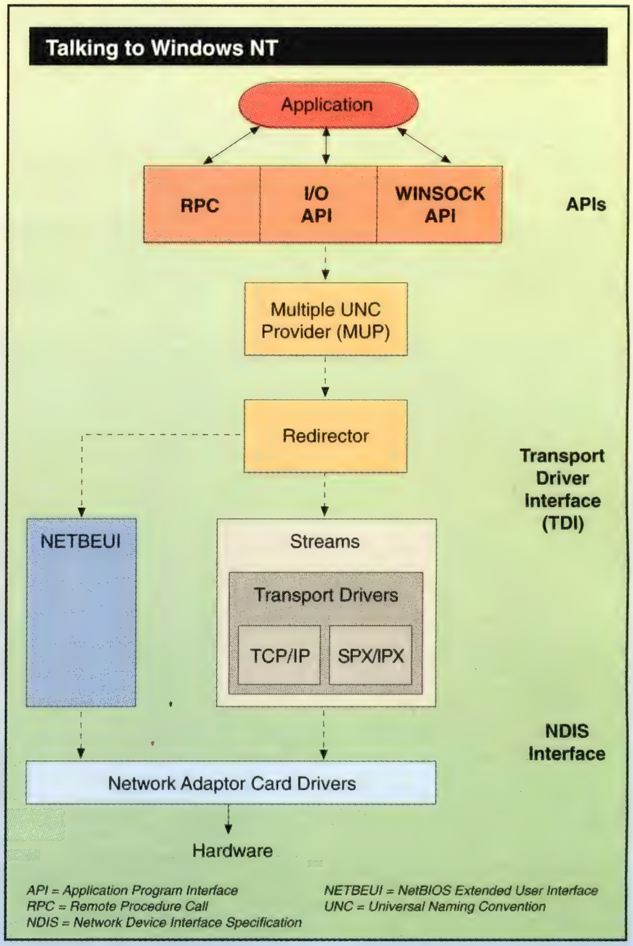
The next component to come into play is the Multiple Universal Naming Convention (UNC) Provider (known all together as the MUP). UNC, which was first implemented in LAN Manager, defines the naming conventions that make it possible to assign unique identifiers to files, shared pipes, and printers, and the servers these resources reside on. Windows NT's MUP is responsible for handling service requests from multiple APIs and routing the requests to the appropriate redirector.

The redirector uses TDI to access network transport services. Similar to the X/Open transport interface, Microsoft's TDI insulates clients and servers from the details of the transport protocol. The beta version of Windows NT supports TDI with NetBEUI and TCP/IP transport protocols. IPX/SPX will be supplied by Novell's client software for Windows NT.

TDI supports both connection-oriented and connection-less (datagram) services. Both are necessary for different types of client-server applications. RPC-based applications typically use datagrams, while file transfers use connection-oriented services.

In Windows NT architecture, TDI is layered above Streams, which was adopted from Unix System V. Streams surrounds the transport driver; this simplifies the porting of Streams transport drivers to Windows NT. Below Streams are NDIS network drivers. Instead of writing a driver for every possible transport protocol, network vendors can use the NDIS interface as the top layer of their network driver software. The NDIS network driver sends and receives data over the network physical connection and manages the adaptor card. It starts the I/O on the card and notifies the transport protocol driver when transfers are complete. NDIS enables several transport protocols to operate at the same time on a single adaptor card.

The NDIS included with Windows NT is different from the NDIS supported by LAN Manager. Microsoft redesigned NDIS so that it will operate in the 32-bit Windows NT environment.


Talking to Windows NT

API = Application Program Interface
RPC = Remote Procedure Call
NDIS = Network Device Interface Specification
NETBEUI = NetBIOS Extended User Interface
UNC = Universal Naming Convention

operation to continue after unusual conditions, such as hardware errors or application errors, have occurred). And a quota function tracks and allocates system resources to keep programs from using more than their share.

Broken Windows

For all that, Windows NT isn't totally bulletproof. The failure of one processor in a multiprocessor machine, for example, will kill the entire system. This type of catastrophic failure, of course, is extremely difficult for an OS to deal with. Mainframes can handle this sort of problem, as can some fault-tolerant versions of Unix like the one offered by Stratus Computer.

Security is another concern for IS managers. To make Windows NT acceptable to many security-minded users, Microsoft has made certain that the OS can pass the US National Computer Security Centre's C2 security test. C2 represents a fairly stringent set of security requirements (though not the strictest guidelines by far). Obtaining C2 security is a drawn-out process, so official certification has not yet been granted.

C2 security requires that an OS validate many of the low-level operations that it performs. To that end, Windows NT asks for an ID and password from each user and provides access control lists for system resources. The price for such security is that applications and software cannot directly address hardware. This can adversely affect performance and restrict functionality, especially for DOS and Windows.

Compatibility is another big concern for IS personnel: No one would give Windows NT a second look if it couldn't run DOS and Windows applications. Backward compatibility with OS/2 and LAN Manager applications also is important.

NT makes a valiant effort to run as many applications as possible, but it can't (and doesn't) run everything. Any DOS, Windows, or OS/2 program that must talk directly to hardware (some of the Norton Utilities, for instance) or that are timing-dependent (such as some comms software) will have trouble running under Windows NT.

Right now, Windows NT's OS/2 support is limited to character-based applications. This shortcoming appears to be the result of a marketing rather than a technical decision (Microsoft isn't looking to give anyone a reason to develop Presentation Manager applications). But that decision isn't going to cut it with corporations that have developed OS/2 applications based on the OS/2 Presentation Manager graphical user interface.

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Microsoft is happy to talk about supporting Presentation Manager but so far has made no specific promises.

Windows NT supports the IEEE 1003.1 Posix API. Posix is a set of APIs and utilities originally intended to allow applications to be easily ported to different versions of Unix. At this point, Posix support has been announced or implemented in many OSs, including IBM's MVS and DEC's VMS.

Windows NT, however, doesn't deliver all the functions specified by Posix, including a Unix shell and utilities. While this sort of limited Posix support makes it easier to port Unix applications to Windows NT, developers can't just recompile and install an application as they could if Posix were completely supported.

Finally, any operating system that works with the symmetric multiprocessor computers now being pressed into service as network servers is guaranteed instant scalability. Machines like the SystemPro from Compaq and the Symmetry from Sequent typically contain from two to 16 processors. Vendors that wish to port Windows NT to such platforms need only supply their own versions of the OS's Hardware Abstraction Layer.

Doubtless, IS personnel will find much to admire in Windows NT (and will note shortcomings as well). Meanwhile, competition for the high-end PC operating system market is intensifying. Technical supremacy is no guarantee of success, and factors such as price, distribution channels, and alliances may ultimately prove more important. Bear in mind that DOS and Windows control the desktop today because they inexpensively run the applications that users want. The OS vendor that attracts the greatest number of developers will be in a very strong position.

Intangibles such as the comfort factor also will play a part. Unix has a long, distinguished record as a high-end server operating system. Even OS/2 has a lead on Windows NT insofar as it's a known quantity. And most corporate users know all too well that it took Microsoft three attempts to get DOS right and three turns to make Windows work. Although the beta version of Windows NT is impressive, it will take time for the product to mature.

And if Windows NT is going to establish itself as a network operating system that delivers file and print services to clients, it's going to face a showdown with a well-established competitor — Novell's NetWare. At the moment, NetWare controls about 70% of the NOS market. Of course, this isn't the first time Microsoft has gone after this segment. The first time around it tried to sell LAN Manager through other system vendors. But Novell had already established a strong reseller channel of its own and had garnered enough user loyalty to let NetWare remain the industry standard. And the company isn't sitting still. Its response, in part, is to enhance NetWare and enter the Unix market. Without a doubt NetWare — especially NetWare 4.0 — delivers far more advanced network services (such as global directories) than Windows NT. Unixware also is a strong contender.

With Windows NT, Microsoft is hoping to leverage its pre-eminence among PC operating systems into control of the network. By keeping the price of Windows NT low and offering network services close to those furnished by Novell, Microsoft may be able to position Windows NT as a viable alternative to NetWare. Users who employ Windows NT for server applications will likely question whether NetWare is worth the extra money. They may ultimately decide to go entirely with Windows NT for all their networking needs.

Dennis Linnell is a Principal at US-based Gate Technology, a consulting firm specialising in IBM operating systems and communications products integration.

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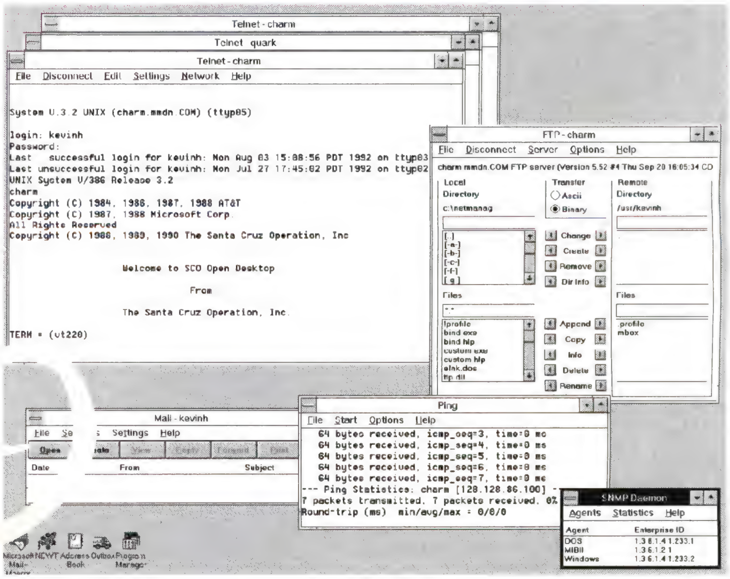

```
System U.3.2 UNIX (charm.mmdn.COM) (ttyp05)

login: kevinh
Password:
Last   successful login for kevinh: Mon Aug 03 15:08:56 PDT 1992 on ttyp03
Last unsuccessful login for kevinh: Mon Jul 27 17:45:02 PDT 1992 on ttyp02
UNIX System V/386 Release 3.2
charm
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Copyright (C) 1988, 1989, 1990 The Santa Cruz Operation, Inc


                    Welcome to SCO Open Desktop

                                From

                    The Santa Cruz Operation, Inc.

TERM = (vt220)
```

charm.mmdn.COM FTP server (Version 5.52 #4 Thu Sep 20 16:05:34 CD

Local Directory: c:\netmanag

Remote Directory: /usr/kevinh

Local: [..] [-a-] [-b-] [-c-] [-f-] [-g-]

Files: *.*

Local files: !profile, bind.exe, bind.hlp, custom.exe, custom.hlp, elnk.dos, ftp.dll

Remote files: .profile, mbox

```
   64 bytes received, icmp_seq=3, time=0 ms
   64 bytes received, icmp_seq=4, time=0 ms
   64 bytes received, icmp_seq=5, time=0 ms
   64 bytes received, icmp_seq=6, time=0 ms
   64 bytes received, icmp_seq=7, time=0 ms
--- Ping Statistics: charm [128.128.86.100] -
7 packets transmitted, 7 packets received, 0%
Round-trip (ms)  min/avg/max = 0/0/0
```

Agent	Enterprise ID
DOS	1.3.6.1.4.1.233.1
MIBII	1.3.6.1.2.1
Windows	1.3.6.1.4.1.233.2

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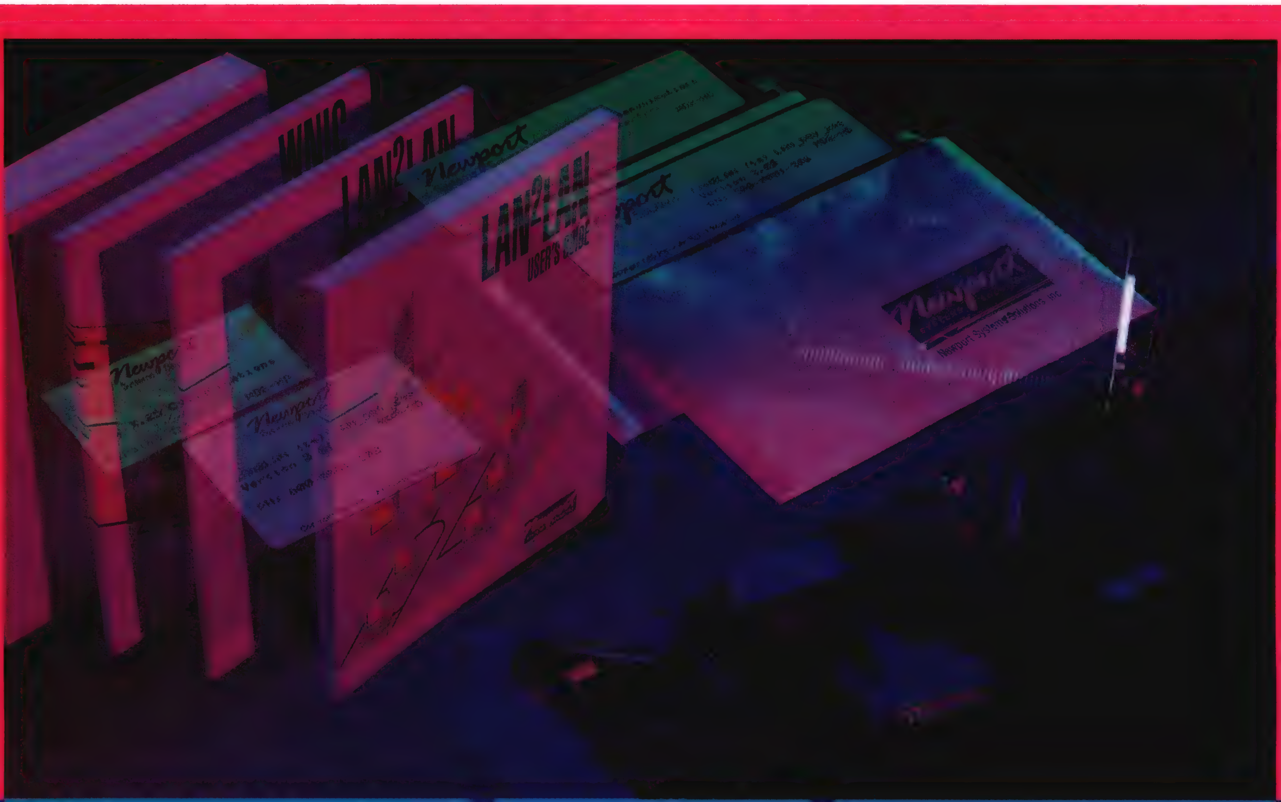
LAN^{2}LAN internetworking.



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APPN Rises to the Enterprise Challenge

While TCP/IP currently leads the race to establish the enterprise network architecture of the future, IBM's Advanced Peer-to-Peer Networking offers some powerful features that TCP/IP can't match.

SNA is out; TCP/IP is in. That's the word from networking industry trend spotters as they forecast the future of corporate networks. SNA may have dominated mainframe-based corporate networks for the past two decades, but tomorrow belongs to the network architecture that can handle applications running on decentralised, cooperative computing platforms as well as on mainframes. Those in the know are saying TCP/IP is the architecture that best fits this bill.

IBM begs to differ. Although SNA's best days are behind it, IBM believes — or at least hopes — that it will continue to shape the course of corporate networking with its next-generation architecture: Advanced Peer-to-Peer Networking (APPN).

APPN, derived from SNA, meets the most important criteria for emerging enterprise networks: It allows large and small computers to communicate as peers across local and wide area links at a variety of data rates, and regardless of the size of the network. APPN also delivers a rich set of directory, session, presentation, configuration, management, and security services, and it can be accessed by a powerful set of application interfaces that enable users to exploit network services fully.

Despite all these strengths, IBM is going to have a hard time selling APPN as the heir apparent to SNA. One big reason is that IBM mainframes no longer dominate the corporate computing landscape as they did in the early 1970s, when SNA began its reign. Now that IBM no longer has absolute control over corporate networks, alternative architectures — specifically OSI and TCP/IP — can compete with IBM's offerings.

TCP/IP has taken the early lead in the race to become the preeminent architecture for enterprise networks. TCP/IP now holds three big advantages over APPN. First, it has the backing of all the major vendors, including IBM itself. And unlike the proprietary APPN, TCP/IP is an open standard governed by the vendor-independent Internet Activities Board. Finally, TCP/IP is available now in real products. OSI has similar strengths compared with APPN, and is increasingly being chosen throughout Europe, Asia and the Asia Pacific. For whatever reasons, however, OSI has never established a formidable presence in North America.

TCP/IP's three advantages will make it tough to beat. But APPN has strengths of its own, many of which can be understood only by taking a close look at the architecture and by fully understanding exactly what users need from their enterprise networks.

Put simply, users need an end-to-end, enterprise network architecture that can handle mission-critical applications as they move from mainframes to distributed LANs and hosts. APPN was built specifically to handle this task; TCP/IP was not. With its Advanced Program-to-Program Communications (APPC) interface and with IBM's Common Transport Semantics, APPN tops TCP/IP with a more robust enterprise architecture, a richer application program interface (API), better network management, and superior integration with existing SNA networks. This last advantage should not be taken lightly — organisations that have spent tens of millions of

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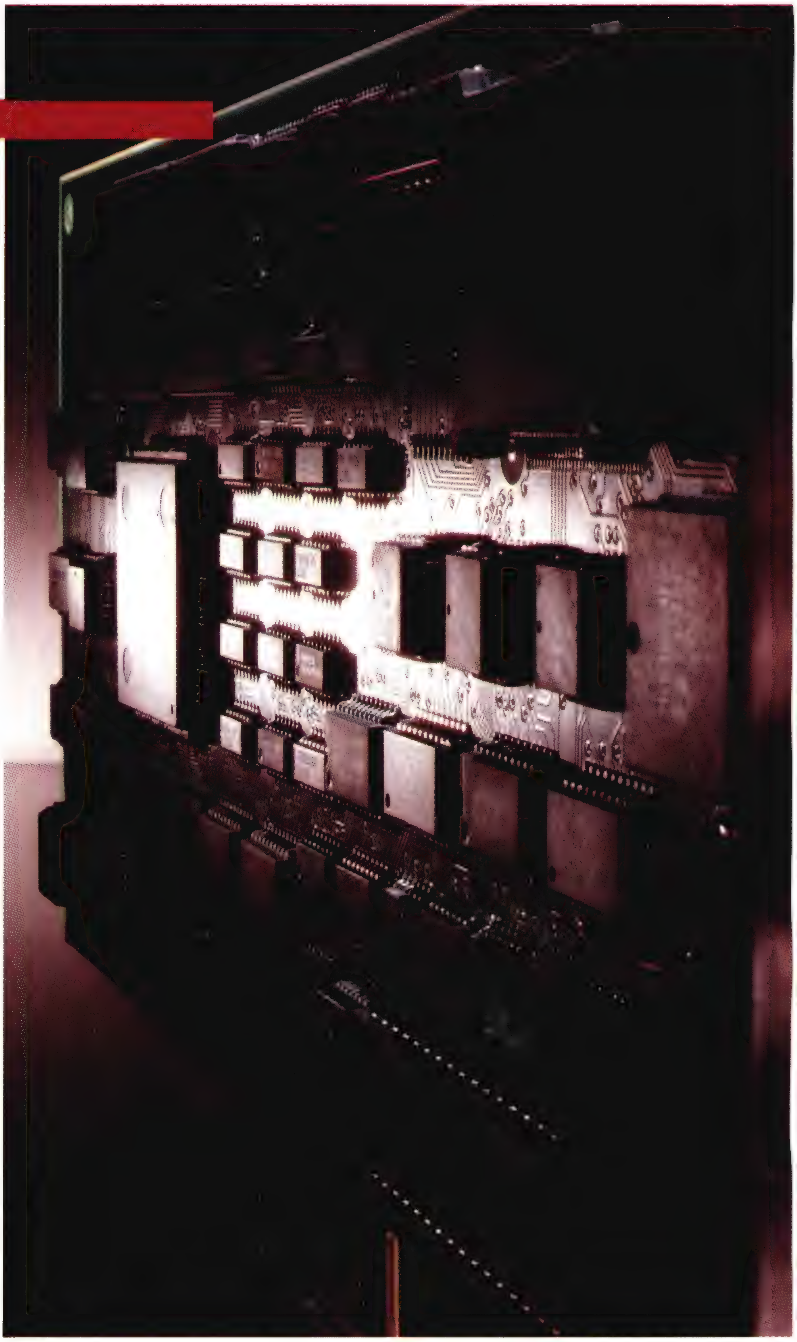

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dollars on SNA gear over the years aren't likely to abandon their investments quickly.

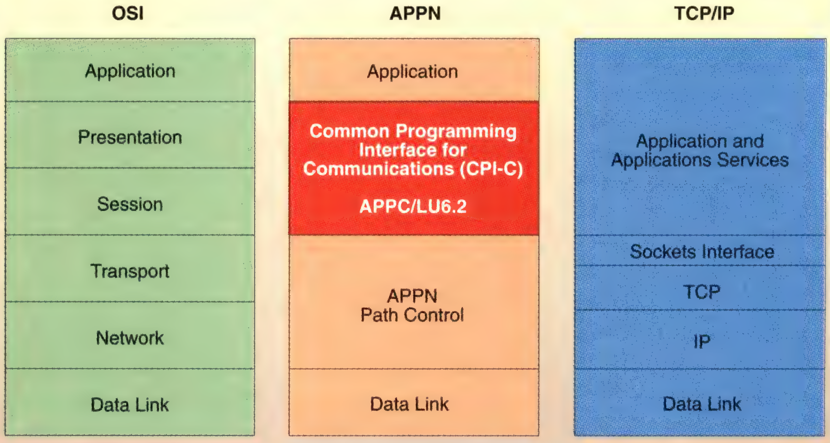
Of course, the most elegant or comprehensive solution to a problem doesn't always turn out to be the one that carries the day. One of the reasons TCP/IP has gained such a following among vendors and users is that it embodies technology that is relatively simple. Standards groups and others are currently working to build more features into TCP/IP, including support for larger networks and more robust management.

But building and maintaining major network applications distributed throughout the enterprise poses a number of unique challenges that can't be met with an architecture that's been designed to accommodate workgroups. Corporations will expect their enterprise network architecture to provide all the management, security, and fault tolerance they've grown used to on their mainframe-based networks.

That's why, at the very least, managers of enterprise networks must understand and evaluate APPN's formidable powers before making any decisions about their future network architecture.

Figure 1: OSI, APPN, and TCP/IP, Layer by Layer

APPN's use of CPI-C and Advanced Program-to-Program Communications (APPC) gives it a much richer interface between application and transport layers than is offered by TCP/IP, which uses a simple sockets interface.



APPN Today

APPN is now at a critical stage in its deployment. Although IBM actually began to roll out APPN features in its midrange computers as early as 1986, it won't be until later this year that the architecture will be available in full force on all of IBM's major platforms, including PS/2 desktop computers, AS/400 minicomputers, System/370 hosts, 3174 controllers, RS/6000 workstations, and 6611 multiprotocol routers. IBM's principal network software for mainframes, called VTAM, is scheduled to enter the APPN fold this year.

Enhancements to APPN and APPC, its key application interface, won't stop once platforms have achieved basic peer-to-peer communications. IBM has already plotted out APPN's next two generations. These future incarnations — dubbed APPN+ and Gigabit APPN — will push the architecture into gigabit and multi-gigabit packet technologies and bring major enhancements in services and routing techniques.

Before IBM gets to those next generations, it has to deal with the present, and this means trying to win support for APPN over TCP/IP and OSI. The reality is that all three protocol types probably will survive as enterprise architectures; many leading vendors, including IBM, already offer products that support all three protocols. Cisco, the leading maker of multiprotocol routers, has formed a consortium of more than a dozen independent vendors to create an architecture that can run APPN protocols over a TCP/IP backbone. Specifications for the architecture, which is known as Advanced Peer-to-Peer Internetworking (APPI), are expected to be published in June by the consortium, called the APPI Forum. Because APPI is a TCP/IP derivative, much of the comparative information that follows applies to it as well as TCP/IP.

Comparing Functions

In terms of functions provided, APPN layers do not map exactly to OSI or TCP/IP layers, but some comparisons can be made (see Figure 1). One notable difference is that TCP/IP lacks well-developed session synchronisation services that provide applications with a rich set of API functions. APPN is built to handle transaction processing and host access applications characterised by sustained batch (one-way) and conversational (two-way) communications, which require a high degree of synchronisation. TCP/IP applications, which typically are built for client-server or remote procedure call (RPC) environments, use a simple 'socket' interface to share transport connections.

Client-server network protocols, such as AppleTalk, IPX/SPX, and NetBIOS, are ill-suited for communications beyond the local area. LAN protocols operate under the general assumption that large chunks of bandwidth are available. Their excessive use of routing and name broadcasts and their sensitivities to delays introduced by complex LAN/WAN internetworks effectively eliminate them as enterprise network protocols.

These inefficiencies are among the reasons multiprotocol backbones are not a good long-term solution for enterprise networking. Today's high-end multiprotocol routers handle all the major LAN protocols as well as TCP/IP; many routers also now include some SNA and OSI support.

Backbones built with these routers solve the immediate problem of eliminating many separate, parallel physical networks, but do not reduce the complexities of configuring and managing so many different protocol suites. Multiprotocol routers must maintain a logical network for each protocol type included in the backbone. In large networks, this task will certainly prove daunting.

APPN Platforms and Links

IBM defines the devices that participate in APPN networks as one of two types: APPN End Nodes and APPN Network Nodes. End Nodes are individual computers, along with their operating systems, applications, and peripherals. Network Nodes are intermediate routing nodes that move traffic between End Nodes. All Network Nodes have full routing and directory capabilities, regardless of the platform used. Many platforms can function as either End Nodes or Network Nodes; these include PCs running OS/2, AS/400s, S/370 hosts, RS/6000 workstations, and third-party Unix systems with APPN software. IBM's own 6611 routers and 3174 controllers are able to operate as Network Nodes only.

The most basic subset of APPN functionality is contained in the Low Entry Networking (LEN) node, a type of APPN End Node. To take advantage of APPN directory and topology services, a LEN node needs some help from an adjacent APPN Network Node, which can be connected to the LEN node via a local area network link or a direct point-to-point link.

All major IBM platforms offer at least LEN node functions. For many platforms, LEN is the first step to full APPN support. For instance, IBM hosts won't be brought completely into the APPN fold until later in the year, but those hosts now have LEN peer-to-peer functions.

As with SNA, OSI, TCP/IP, and other layered architectures, APPN offers link independence, which means APPN nodes can exchange data via a wide array of local and wide area data-link protocols. Almost any

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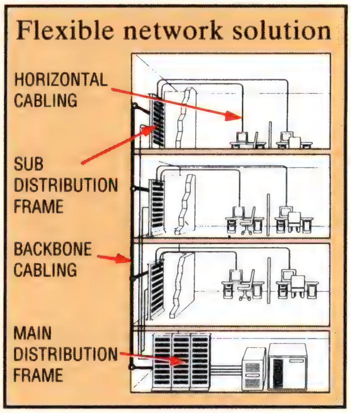

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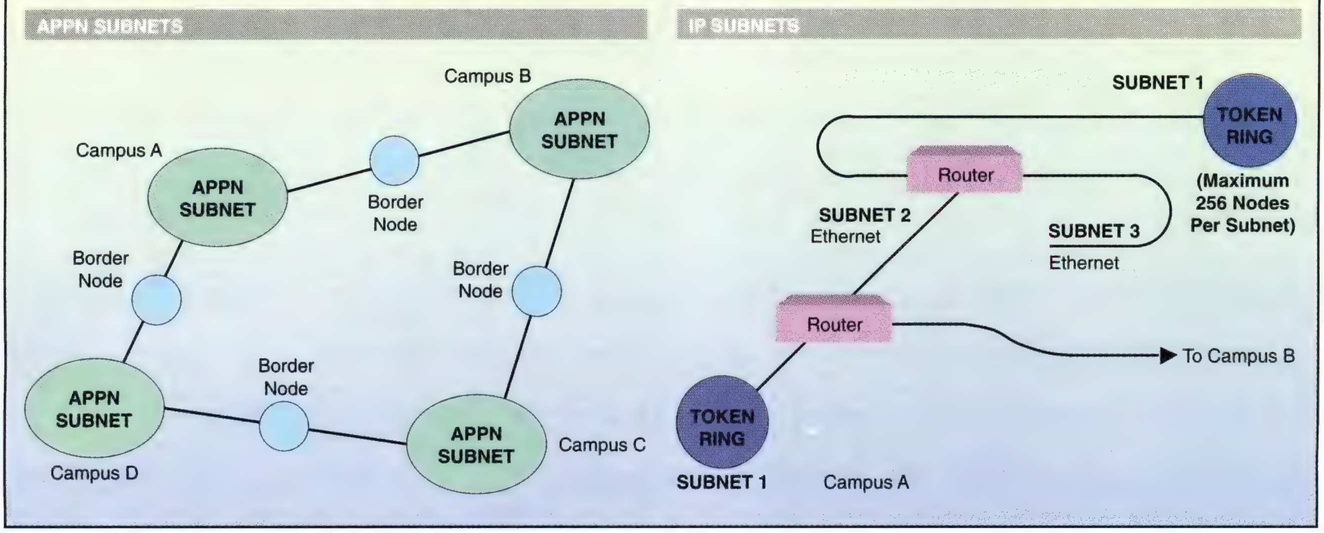
Figure 2: More Nodes Per Subnetwork

While TCP/IP's naming conventions limit the number of nodes on a subnetwork to a maximum of 256, APPN can accommodate upward of 10,000 nodes per subnetwork, cutting the number of subnetworks required for large installations.



link available on an IBM platform can be used by APPN, including Token Ring, Ethernet, frame relay, X.25, Async, SDLC, FDDI, and ISDN. APPN traffic is even able to run over direct channel attachments between hosts and their peripherals. Theoretically, APPN can run over all kinds of links, ranging from 1.2Kbps dial-up WAN lines to 45Mbps T3 trunks or even faster asynchronous transfer mode (ATM) or Synchronous Optical Network (Sonet) links. For high speed links like ATM or Sonet, however, APPN needs the kinds of enhancements that will go into APPN+ and Gigabit APPN.

APPN traffic is able to run over a combination of link types. APPN can make use of switched links (like dial-up lines, X.25 switched virtual circuits, and ISDN) or non-switched links (such as X.25 permanent virtual circuits, leased lines, and LANs). To cut transmission costs, APPN can help de-activate a switched link when there is no traffic. APPN can also make use of multiple switched or non-switched links between stations in parallel.

Because APPN is a highly scalable architecture, it can adapt to topologies that range from the smallest workgroup to an enterprise network with tens of thousands of nodes. On an enterprise scale, APPN can provide the basis for a hierarchical topology, with PCs and workstations on the bottom tier, LAN servers and minicomputers on the middle tier, and mainframes at the top. In this type of network, the mainframe can function as a host for terminals or as a master file server that accepts back-end queries from the LAN servers and minicomputers residing on the tier below.

APPN can be used to route traffic between 3270-type terminals and hosts in centralised configurations, replacing the conventional SNA networks.

Like OSI and TCP/IP, APPN supports a wide array of mesh, star, ring, and hierarchical topologies and can divide a large network into logical subnetworks. This ensures traffic flows outside a subnet only when it needs to. APPN subnets are connected by Border Nodes — Network Nodes equipped with features to limit the flow of topology, directory, and end-user data between subnets.

APPN possesses several advantages over TCP/IP when it comes to node addressing. TCP/IP networks are subdivided by IP addresses that designate a logical subnetwork corresponding to a LAN port on a router. Organising TCP/IP end nodes (IP hosts) into subnets and assigning IP addresses is not only time-consuming for large networks, it's also problematic, because no more than 256 32-bit addresses are permitted to reside on a subnetwork.

APPN avoids the limitations of IP addressing in several ways. First, APPN addresses are alphanumeric, whereas IP addresses are numeric only. Because of this, the number of different node names available under APPN can reach into the billions. Rather than the 256-node limit on TCP/IP subnets, APPN subnets can include upward of 10,000 nodes, meaning nodes located in multi-building campuses can be included in the same subnetwork (see Figure 2). Also, APPN addressing is not tied to router ports or LANs, so moving an APPN node generally does not require changing its subnet address. A feature called automatic registration means Network Nodes automatically get details of links, ports, and resources for any End Node added. OSI's addressing/subnet scheme is similar in scale to that of APPN.

Dynamic Routing

One of the most important aspects of OSI, TCP/IP, and APPN is their ability to eliminate the repetitive manual network definition chores required by SNA. At the core of any network architecture are the services that route units of data from a source node to a destination node across intermediate nodes. In sub-area SNA networks, node and link information has to be entered manually into tables on the host, in the time-consuming, cumbersome sysgen definition process.

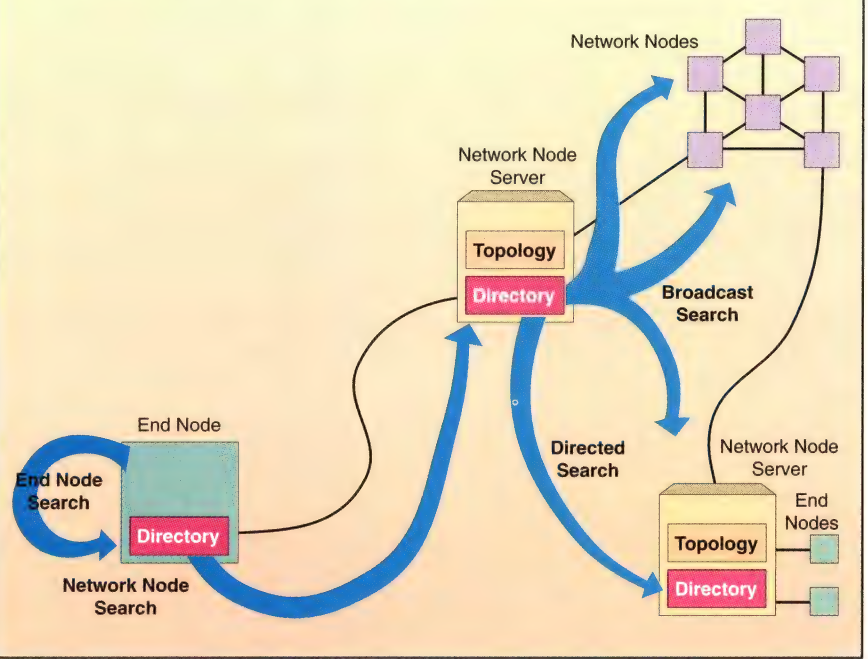
APPN automatically stores information about all its Network Nodes and their links in a topology database that is replicated on each Network Node. Network Nodes automatically update one another's topology databases whenever the network configuration changes via topology database updates (TDUs).

TDUs conserve network bandwidth. The only time an APPN Network Node receives a complete routing table (listing all nodes and links) is when the node is initially inserted into the network. If a Network Node is ever temporarily disconnected, on reconnection it will receive only information on topology changes that have occurred since it was disconnected. Every five days, APPN Network Nodes reaffirm their topology databases with other nodes. Any information not reaffirmed within 15 days is purged from the database. This helps keep database overhead under control.

On any network, a major failure can cause an excessive number of updates to flow between routing nodes, impeding the convergence process, or the reconstruction and synchronisation of routing tables. To safeguard against redundant updates, APPN has a flow-reduction function that restricts the passing of TDUs between Network Nodes. If a large APPN network has been divided into subnetworks, Network Nodes in each subnet maintain a topology database for their own subnetwork only.

Figure 3: APPN Directory Searches

To establish a link to another End Node, an APPN End Node first searches its directory for the target node's Logical Unit (LU) address. If the address is stored locally, the session can be established without the intervention of the Network Node. The request is forwarded to the Network Node only if the address isn't stored locally.



APPN's approach is more efficient than those used by TCP/IP and OSI routers. The routing information protocol (RIP) used in some versions of TCP/IP requires routers to send complete routing tables to one another during updates. The overhead involved in sending so much data around the network makes RIP-based TCP/IP networks less efficient and can cause problems in maintaining an accurate consistent picture of the network on all routers. RIP is particularly vulnerable when attempting to recover after failures in large networks.

Most of the recent TCP/IP implementations use a streamlined router-to-router protocol called open shortest path first (OSPF). OSPF improves on RIP by sending updates only when topology changes occur, but it lacks APPN's sophisticated flow-reduction techniques. OSI's routing protocol, intermediate system to intermediate system (IS-IS), is functionally similar to OSPF.

When an End Node is connected to an APPN network, it is assigned to an easily accessible Network Node that becomes its server. Each Network Node server can have 100 or more End Nodes connected to it. In addition to maintaining network topology databases, each Network Node server keeps track of the links and resources on the End Nodes it serves. This information is shared with other Network Node servers, but only when it is specifically requested.

Thus, a complete representation of an APPN network exists in the combination of the Network Node topology databases and the information kept by individual Network Node servers. Although End Nodes rely on Network Node servers for most directory and routing services, they do have a limited directory of the links and resources they can access directly.

Directory Advantages

APPN also holds some important advantages over TCP/IP when it comes to directory services. TCP/IP's directory server, called Domain Name Service (DNS), allows for the manual registration of network names and addresses. With TCP/IP, an application typically knows the name of a resource it needs to access. By sending this name to the DNS, the sending application can learn the 32-bit IP address of the target resource. That address then is put in each packet, and is used by the routers to calculate the route to the destination.

Under APPN directory services, the server takes the names of the involved End Node resources (known as Logical Units, or LUs), resolves them into a path, and then works with routing services to set up a session through the network. The packets then traverse the network using only a 17-bit label, rather than the full name or address of the End Nodes.

This feature, called label swapping, is a key APPN advantage. The 32-bit addressing scheme used by TCP/IP creates a great deal of system overhead, since source and destination address field must be carried in each routed packet. By using only a 17-bit label, APPN requires less system overhead than TCP/IP, even though the APPN node names are 128-bit alphanumeric addresses, as opposed to the more limited 32-bit names used by TCP/IP.

Keeping Overhead Down

Label swapping is only one way that APPN minimises network overhead. In SNA and APPN, applications use the network by accessing LUs, high-level software interfaces that reside on End Nodes and Network Nodes and that correspond to the OSI session layer and higher.

APPN's directory and topology components locate and provide services to LUs. Applications interface with LUs, not with APPN. When one application requests a session with another, it tells its local LU to find the other application's LU. The two LUs set up the session using APPN routing services; the two applications then exchange data via the LUs. An application can access multiple LUs simultaneously, and a single LU can service multiple applications.

APPN End Nodes keep a list of their local LUs and can automatically register their LUs with their Network Node server (LEN node LUs must be entered manually). Once entries are made, a Network Node server will locate LUs for its End Nodes, and will also converse with other servers to locate remote LUs.

To locate LUs and other APPN system resources, APPN directory services provide several layers of search functions: End Node directory searches, Network Node server directory searches, Network Node broadcast searches, and directed searches (see Figure 3). When an application attempts to locate another application, APPN first looks in the End Node's local directory for the LU associated with the target application. In some cases, the target LU can be reached on a direct link without the help of intermediate Network Nodes. If the LU is not in the local directory, APPN checks the End Node's Network Node server directory. If the LU is not there, the Network Node server initiates a broadcast search to all other Network Nodes, requesting the location of the target LU.

Broadcast searches can use a great deal of bandwidth, given the number of active users on a large network. To limit broadcasts, Network Node servers create cached directory entries for the LUs they locate. Cached entries contain the name of an LU and the route to get to it, specified by a list of intermediate links and nodes (source routing).

When an End Node requests the location of an LU that has already been cached, the Network Node server performs a directed search to verify the location of the target LU. This enables nodes to establish sessions with frequently accessed LUs without the need for repeated broadcasts. For regularly used LUs, APPN will also facilitate searches with 'system-defined' directory entries

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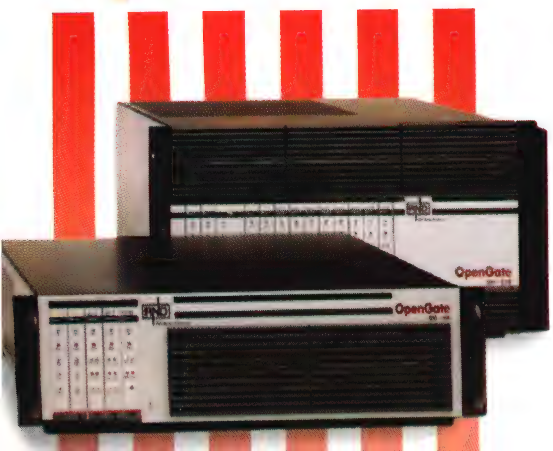

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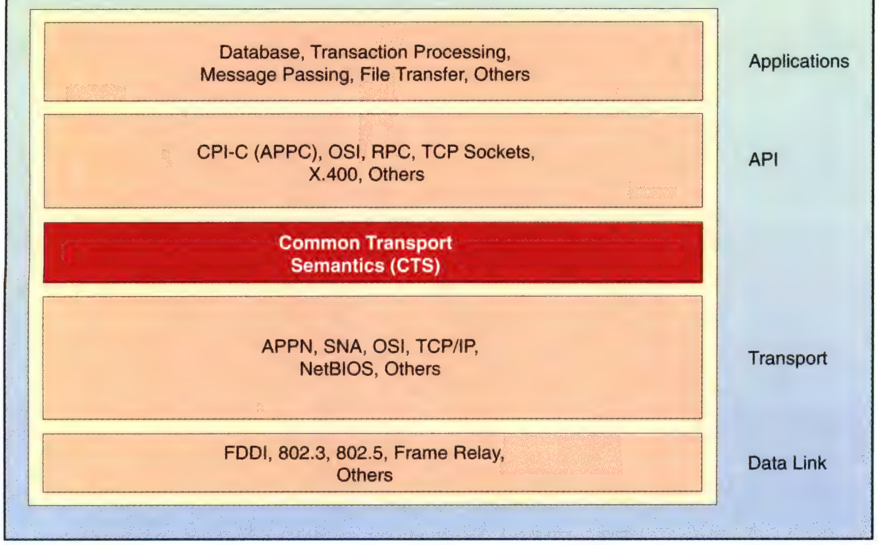
Figure 4: IBM's Networking Blueprint

Under IBM's planned networking scheme, the CTS layer enables high-level APIs like CPI-C and APPC to be independent of transport protocols, which in turn are independent from data link protocols. Components at each layer are modular, which means they are interchangeable.


Database, Transaction Processing, Message Passing, File Transfer, Others
Applications
CPI-C (APPC), OSI, RPC, TCP Sockets, X.400, Others
API
Common Transport Semantics (CTS)
APPN, SNA, OSI, TCP/IP, NetBIOS, Others
Transport
FDDI, 802.3, 802.5, Frame Relay, Others
Data Link

defined by the network operator and kept in the Network Node directory. APPN also provides a centralised directory feature that allows Network Nodes to query a master directory containing enterprise-wide information. Central directory services, which usually reside on a mainframe system, conduct searches and directory caching on behalf of Network Nodes. This feature is also intended to minimise broadcast searches.

IBM has made APPN's central directory services part of its Virtual Telecommunications Access Method (VTAM) plans, laying the groundwork of enterprise-wide directories based on mainframes. APPN mainframe directory services differ greatly from VTAM resource definitions. APPN mainframe directories can be updated from any End Node; VTAM lacks such universal access. The combination of universal directory access with the huge cache and backup storage of mainframes gives users the best of both distributed and centralised worlds.

Routing & Congestion Control

Once an APPN End Node finds the location of its largest node, a specific route must be calculated through the network. Large, complex networks typically have many possible routes between two End Nodes. Under APPN, each time an application requests a session through the network, it stipulates a class of service that includes such parameters as route security, bandwidth, propagation delay, and cost. The link is then set up to meet the class-of-service stipulations.

If a given session can tolerate low-security and high-delay links, the route may pass through a satellite link and an unsecured LAN. But if the application requires high security, low delay, and high bandwidth, APPN may choose a route through a secure E1 link and a secure high speed LAN.

Class-of-service routing is particularly helpful in handling a mix of batch and interactive traffic. With it, sessions requiring real-time end-user interaction can be given higher priority than batch traffic generated by file transfers and remote job entry.

Class-of-service routing dictates which route will initially be chosen; APPN also has a transmission priority scheme that can be used to determine which traffic gets priority once data starts flowing. With transmission priority, applications request high, medium, or low priority for their traffic.

Both class-of-service routing and transmission priority can be specified by an application with a single 'mode' name during session establishment. Network operators can fine-tune APPN route selection further by assigning a 'resistance' value to each intermediate Network Node. Nodes with lower values will be favoured in route selection.

TCP/IP has the potential to provide class-of-service routing, but IP routes generally are based on minimal criteria, such as least number of hops between nodes. Few, if any, IP router vendors have implemented class-of-service routing, and there are no widely accepted standards for applications to request different services from a multivendor TCP/IP network. OSI has robust class-of-service features, but the level of sophistication depends on a given vendor's implementation scheme.

A major factor in any routing scheme is the ability to handle the congestion that inevitably occurs. The primary means for dealing with congestion is pacing, the process of limiting the traffic a node receives. Pacing typically is handled with some form of sliding-window flow control.

TCP/IP and OSI manage congestion with end-to-end pacing that puts flow control at the end nodes. But APPN has an adaptive pacing scheme that puts pacing both on End Nodes (including LEN nodes) and on Network Nodes. When traffic gets heavy, a node that becomes overloaded can throttle back the traffic it receives by signaling the sending nodes to slow down. When the congestion dissipates, the node can then signal to the sending nodes to increase the traffic volume.

APPN's adaptive pacing will eliminate many of the problems that congestion can cause on TCP/IP networks. IP routers use a 'connectionless' network layer (Layer 3), which means flow control and error recovery take place at TCP Layer 4. When an IP router becomes congested or receives a bad packet, it simply drops packets — it's up to the end nodes to detect the problem and retransmit any dropped packets.

This scheme works when errors are few and congestion is minimal. But as error rates and congestion increase, the connectionless approach wastes network bandwidth as packets drop and end nodes time out. APPN's node-by-node adaptive pacing doesn't drop packets, ensuring that network links are utilised efficiently.

Unfortunately, adaptive pacing requires APPN to establish a static route through the network for each session. If any link in the route subsequently fails, applications must restart their sessions. TCP/IP's connectionless datagram service routes each packet on the best available route at the time that packet is sent. If a link fails, TCP/IP reroutes packets automatically, making the failure transparent to applications. Obviously, the ability to reroute traffic dynamically is a big advantage that TCP/IP now holds over APPN. But the edge is a temporary one, IBM asserts. IBM expects to correct this flaw in APPN with the release of APPN+, expected sometime this year or next.

APPN+ Routing

IBM says APPN+ will include a feature known as High Performance Routing. HPR will be part of Automatic Network routing (ANR), a Layer 3 function that provides a source-routed, connectionless service that can drop packets when links are congested. Above ANR resides a Layer 4 end-to-end protocol called Rapid Transport Protocol (RTP), which provides error handling and a rate-based flow control for traffic pumped into the network by End Nodes. Adaptive rate-based flow control is an advanced technique that is designed to handle bursty, high speed traffic.

HPR will integrate seamlessly into the existing APPN architecture, according to IBM. This means it will be interchangeable

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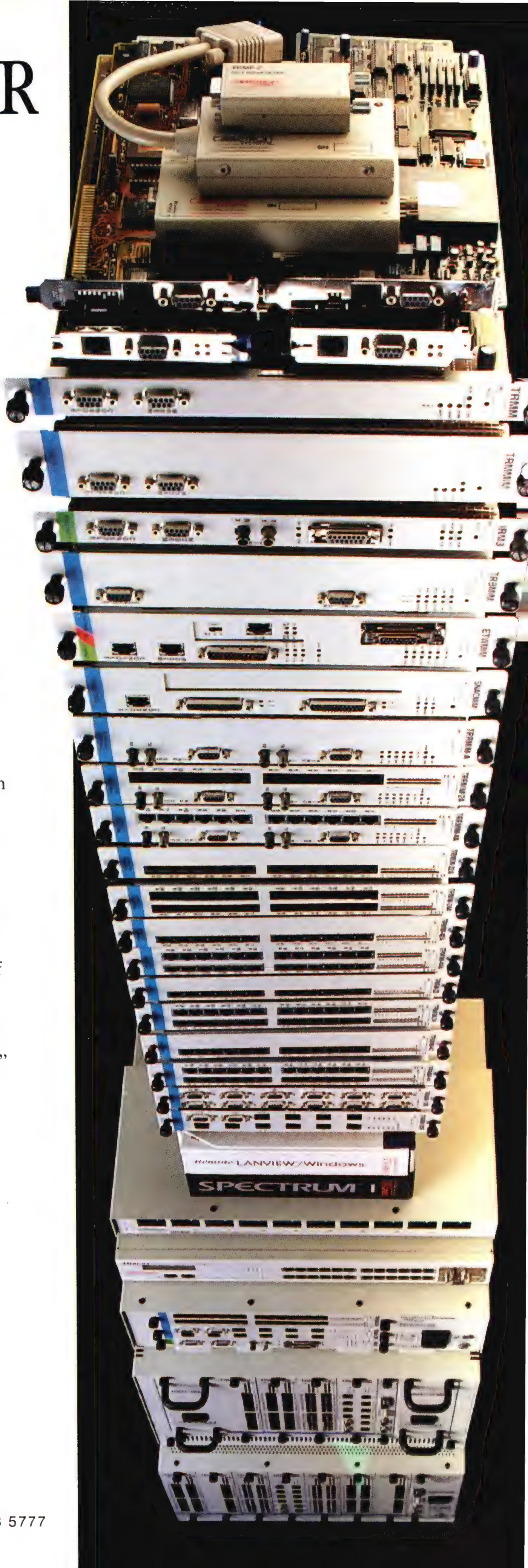

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nit 8, 112/118 Talavera Road • North Ryde NSW 2113 • (02) 878 5777 with, and can co-exist with, Intermediate Session Routing (ISR), the connection-oriented routing service now used in APPN. The plan is to use HPR for high speed fibre and digital links and ISR for slower links. Like ISR, HPR supports full-featured class-of-service routing. Unlike ISR, HPR can automatically and transparently reroute traffic in the event of a link failure. The combination of class-of-service routing and automatic rerouting will boost APPN's stock considerably.

Application Services

The ability of an application to take advantage of APPN — or any architecture, for that matter — is determined largely by the quality of the application program interface (API) used. IBM is making a range of APIs available for APPN and has issued its Networking Blueprint to help conceptualise the relationship between the interfaces and the underlying network protocols (see Figure 4 on page 96).

Three elements are particularly critical to IBM's strategy: High-level APIs are independent from network transport; transport protocols are independent from data links; and blueprint components are interchangeable. Transport independence is achieved through the Common Transport Semantics (CTS) layer, which is defined in the Multi-Protocol Transport Networking (MPTN) architecture. MPTN defines standard transport interfaces that allow applications to be written without any specific transport in mind. MPTN also facilitates gateways between different protocols and the interchange of transport protocols on a given network.

Under the IBM plan, all APIs can make use of APPN or other transport protocols. APPC, IBM's API of choice, is accessed by using the Common Programming Interface for Communications, a cross-platform API.

APPC now is the most robust interface for APPN networks, but others are sure to become popular. IBM tested a TCP/IP sockets interface to APPN during the first half of 1992. This sockets interface (which has been dubbed SNAckets) allows Unix applications to run as-is on APPN networks.

APPN and APPC provide security services at both session and conversation levels. Before APPN establishes a session between two End Nodes, it checks a password established by node operators. When applications attempt to hold conversations across a session, they must first provide the correct password.

APPN/APPC security is more thorough than that available on many LANs, which offer security at the application level but not at the network level. If applications conduct their own authentication in an APPN environment, the result is three levels of security: session level, conversation level, and application level.

Beyond security, APPC offers a rich array of services to applications, including synchronisation, confirmation options, process activation, and error handling. With dozens of verbs and hundreds of parameters, APPC demands a fairly high level of communication programming knowledge. But more software tool vendors are offering programming aids that can make peer-to-peer application development a reasonably straightforward process. For many software houses, APPC has become the interface of choice for database, gateway, file transfer, and utility software products.

Network Management

In conventional IBM SNA networks, VTAM tables maintained by mainframes are the focal point for the configuration, management, and control of enterprise resources. The operator's access to SNA management services is through IBM's NetView network management system and supporting products. APPN, in contrast, distributes management and administrative functions to every node in the network, eliminating the requirement for a single repository of configuration and management information. APPN management can be as distributed or centralised as a network administrator wants it to be.

APPN's management scheme, known as APPN Management Services, is based on OSI's common management information protocol (CMIP). APPN Management Services relies on a flexible system of distributed focal points and entry points. Focal points are points of concentration for management information and control. Entry points monitor various network elements and forward management data (statistics, alerts, and the like) to focal points in a solicited or unsolicited manner. Network Nodes and End Nodes can be either focal points or entry points; typically, however, a Network Node would handle focal-point management services for its End Nodes.

APPN Management Services can be hierarchical, in that a group of focal points can report to a higher-level focal point in a cascaded fashion. A nested approach reduces the LU6.2 sessions required, eliminating the need for each entry point to have its own session with a high-level focal point. At the lower layers of a management hierarchy, a Network Node and its End Nodes can be treated as a single unit.

Components of APPN Management Services include problem diagnosis, configuration, accounting, and operations management. A single focal point can provide all of these services, or the services can be distributed among focal points.

TCP/IP's network management scheme, as embodied in the simple network management protocol (SNMP), is rudimentary compared with CMIP and APPN Management Services. In the majority of cases, SNMP will not be suitable as an enterprise management architecture. Nevertheless, because of its tremendous popularity, SNMP management will probably be incorporated into OSI and APPN.

Integration with SNA

One of the most complex and rapidly evolving aspects of APPN is its relationship with host-based SNA networks. It will undoubtedly take a while, but IBM says APPN and SNA eventually will be fully integrated.

When this happens, APPN nodes will be able to communicate by forwarding traffic through existing SNA networks, and downstream SNA peripheral nodes will be able to send traffic to hosts through intermediate APPN networks.

Equally important, nodes on APPN networks will have complete access to applications on hosts, via the use of peer-to-peer or terminal emulation protocols. Much of this functionality is available today, although not in its most elegant form.

The linch-pin of SNA-APPN integration is host VTAM software. When VTAM gets Network Node and End Node status later this year, full dynamic routing and directory services will be available. Future versions of VTAM will also support host-dependent LUs (in cluster controllers and other peripheral nodes) with a feature that will be called the Dependent LU Server/Requester (dLS/R).

The requester and server work together to chart a path for dependent LUs through APPN and/or sub-area SNA networks. The dLS/R allows dependent LUs to use APPN without changing their native LU packet format, reducing overhead from encapsulation and tunnelling.

The benefits of full APPN support on the host are considerable. SNA's cumbersome sysgen process will be pretty much eliminated when hosts and their controllers are able to dynamically create topologies. As APPN Network Nodes, hosts will be able to function as centralised directory servers for peer-to-peer applications involving thousands of End Nodes. IBM's plans for the future include a 'meshing' of the APPN and SNA directories that will enable seamless directory and session setup procedures across hybrid APPN/SNA networks.

While many multiprotocol routers are encapsulating IBM SDLC traffic or terminating it and replacing it with Token Ring Logical Link Control (LLC) links, APPN is likely to offer users more efficient routing of 3270 traffic. The dSL/R enables controllers and gateways to reroute 3270 traffic through mixed APPN and SNA networks via native SNA protocols — without the need for encapsulation or conversion, and with no overhead.

Norman Friedman is Vice President of engineering at New York-based Systems Strategies, a software developer which specialises in SNA communications solutions.

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High Performance Wireless LAN

Information and Technical Services has announced what the company claims is one of the first wireless LANs to offer performance equivalent to wired LANs. The FreePort Wireless LAN is manufactured by the US firm Windata, and is based on spread spectrum radio technology. The network utilises a hub configuration to provide speed and reliability equal to its wired counterparts in transmitting signals to and from a network of wireless transceivers, according to an ITS official.

Features include: throughput to 5.7Mbps (equal to that of wired Ethernet LANs); industry-standard IEEE 802.3 interface; robust and secure spread spectrum radio communications; reliability consistent with that of wired LANs; and a cost per node comparable to wired LANs, according to ITS. The Freeport LAN consists of a wireless hub with an antenna, wireless transceivers with a multi-user interface option, and SeePort Network Management software. It provides seamless integration into wired LANs for transparent connectivity to all Ethernet networks, according to ITS.

ITS (02) 240 1500

New Novell DOS

Novell has announced an upgrade to DR DOS 6.0, to be called Novell DOS 7.0. The new software includes integrated NetWare client support, peer-to-peer networking, a network management agent, network installation, pre-emptive multi-tasking, enhanced memory management, and desktop security, as well as a suite of protected mode drivers. Novell DOS 7.0 also features an API called DOS Protected Mode Services which reduces the demand for conventional memory.

Novell (02) 413 3077

FDDI Converter

An FDDI multimode-to-singlemode regenerator has just been released by MRV. The new product enables the transmission of FDDI optical signals for up to 70km on singlemode fibre. Remote control is possible via an RS232 link, and the unit incorporates both test and loopback modes. A switch closure relay is used to flag an alarm if pre-set parameters are exceeded.

Kingfisher International
(03) 764 3933

New DEC X-Terminal

Digital Equipment Corporation has announced the release of new models in its VXT 2000 family of X Window terminals. The new colour and greyscale machines, known as the VXT 2000+ models, have performance ratings of 100K stones. Pricing for the VXT 2000+ range will be the same as the current VXT 2000 models, and VXT 2000 owners can upgrade to the new VXT 2000+ via a customer installable video board. DEC is also offering MIT X11.R5 support and the option of a local IBM 3270 terminal emulator, as well as its VXT Essential Server Software free of charge.

Digital Equipment Corp
(02) 561 5252

Analyser Interface

Tekelec has announced the release of a new high speed interface for the Chameleon 32 protocol analyser. The interface allows the unit to monitor traffic at full E1 bandwidths, according to company officials, enabling the analysis of protocols like TCP/IP over frame relay at 2Mbps speeds.

The High Speed Interface is made up of three components: the Two Megabit Acquisition (TMA) engine, which supports both simulation and monitoring of data; the applique, which provides the line coding and data rate for the network interface; and the pod, which provides the physical interface to the network, said the officials.

The new interface comes with software for configuring the physical interface, which has options for line coding, clocking, framing and channel configuration, according to the Tekelec officials.

Tekelec (02) 790 2200

The Scanet Systems Centre is available in three versions

Cray Launches 'Superhub'

Cray Communications has launched what company officials describe as a 'superhub' for the integration of mini and mainframe computers with local and wide area networks.

The new Scanet Systems Centre allows any PC or terminal to communicate with any host or server. The device contains two basic components: an enclosure and replaceable modules. The enclosure contains the central power supply and provides for the interconnection of the individual modules; while the modules provide the device's basic functionality and serve as the link between the enclosure and the stations on the network.

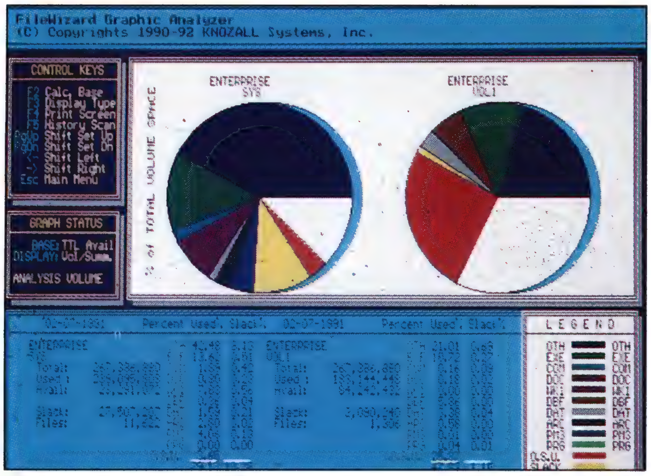
Available in two, five and 17-slot enclosures, the Systems Centre can be configured from a range of 30 interface modules including 10Base-T and FDDI concentrators, terminal servers, translation bridges and routers. The device's backplane architecture comprises multiple high speed buses for Ethernet, FDDI and Token Ring network topologies. Company officials say management facilities include local, out-of-band management and configuration through a large front panel LCD; and comprehensive in-band management facilities through a dedicated PC-based management system.

Officials say the key to the Scanet Systems Centre's any-to-any connectivity concept is its Multi-Function Terminal Server (MFTS) and terminal emulation software. MFTS software combined with the flexible backplane architecture of the ScaNet System Centre make it possible to connect asynchronous, 3270 and 5250 terminals to the same System Centre, they say. Each terminal connected to the MFTS can establish up to five sessions to one or more hosts.

Cray Communications (02) 948 7727

Low End Multiplexer

Scitec has released a new entry-level multiplexer designed to provide an integrated voice/data solution for small companies with up to 16 remote sites. The Maxima 10 has the same Maxima chassis and cards as larger models, and can be upgraded later to full Maxima potential, say company officials. It will support all standard interface



File Wizard helps make the most of the space on your file server

types, including synchronous, asynchronous, and digital and analogue voice, and it can utilise Scitec's CELP low bit rate compression cards.

Scitec has also announced an addition to its family of high-speed private networking modems, the SAT704. The modem is designed as an interface converter for digital-in/digital-out data streams. It is able to take a clear data stream from a multiplexer, LAN bridge or video-codec and modify it so that it is able to be transported over Telecom's 2.048Mbps Megalink connections with G.704 framed protocols. The introduction of G.704 framing avoids the traditional problems of inadvertent triggering of Megalink line alarms and fault-finding difficulties, say company officials.

Scitec (02) 428 9555

Server Management

New FileWizard from NETSoft is designed to enable users make optimum use of the available space on their file server. According to NetSoft officials, the FileWizard scans the server and analyses the available space, and then provides reports by volume, user, directory or file extension.

It can also provide information on how current files are against access time, volume space variance or user, trends of space usage, forecasting, and unwanted files (such as duplicate .BAK files). Company officials said network managers can use the information to build up a strategy for maintenance of their network, which FileWizard is then able to implement, automating a large proportion of their routine administrative work. Pricing for the software is $990 for a one-server pack, $1,950 for a three-server pack, $3,500 for an eight-server pack, and $4,950 for a Corporate Licence Pack.

NETsoft (02) 964 0132

Infra-Red FDDI Links

Infra-red wireless data communication products manufactured by JOLT (Jerusalem Optical Link Technologies) and capable of FDDI-like speeds may soon be operational in Australia following their local release by Hanamax Marketing Services.

Included amongst the JOLT product line now available in Australia are the JDL-889-L and Series 2JDL-889 BD communications systems. Both systems can transmit and receive data at speeds of up to 125Mbps.

According to company officials, JDL-889-L transmitters and receivers are uniquely suited to optical slipring and transport applications. The units are compact and lightweight and can operate outdoors at distances of 30 metres without the use of repeaters. JDL-889-L transmitters have a beam divergence of greater than 30 degrees, while the receivers have a field of view greater than 60 degrees.

Aimed at LAN/WAN applications, Series 2JDL-889 BD systems are suitable for indoor and outdoor use and can be operated at distances of up to 200 metres.

Hanamax Marketing Services (02) 550 4723

DA-30 FDDI Option

Wandel & Goltermann has released its FDDI SmartMon application for its DA-30 Internetwork Analyzer. The company says the new application allows network managers to pinpoint FDDI problems during installation, as well as when the network is fully operational.

Unlike analysers that use expert systems to detect network problems, the DA-30 has the processing power to keep up with FDDI frame rates, according to Wandel & Goltermann officials. SmartMon indicates the source of FDDI networking problems using simple English text, which makes it suitable for use by field service engineers as well as the less experienced network troubleshooter.

The company has also announced plans to extend its DA-3X Internetworking Analyzer into a range of new areas such as ISDN, 2Mbps-ETSI (E1), 52-megabit HSSI, DS1 and DS3, and has also announced that it will enhance the performance of the Token Ring interface.

Wandel & Goltermann
(03) 690 6700

HBM Printer Interface

HBM has released a family of LAN printer interface networking products for users of Hewlett-Packard printers, which the company says will provide an up to 10-fold increase in printer throughput.

The RP21 MIO card fits into the printer's optional I/O slot and provides a direct connection to 10Base-T, Thin Ethernet or Token Ring networks. It is compatible with Novell, Unix, LAN Manager and OS/2 LAN Server network operating systems, according to HBM. The device connects parallel to the printer on one side, and directly to the network wire on the other side, and facilitates the high speed download of print files and data packets from the network to the printer, says HBM.

Each LAN printer interface card can be set up either as a remote printer or as a network node. The card can be user-installed on any HP 11, 111, 3SI and HP IV laser printer, according to company officials.

HBM (02) 907 9388

New Apple Servers

Apple Computer has announced three new Apple Workgroup servers which are aimed at Macintosh-mostly workgroups.

The Apple Workgroup Server 95 delivers high performance file and print services or high-performance relational database management system services. Apple will also be releasing the Apple Workgroup Server 80, a mid-range file and print server, and the Apple Workgroup Server 60, an entry level system.

The Workgroup Server 95 is based on a Motorola 33MHz 68040 processor, and will run an enhanced high-performance version of AppleShare that will boost file and print service performance by up to four times compared with AppleShare 3.0, according to Apple. The system comes with 16MB of RAM, expandable to 256MB, a built-in Apple SuperDrive, built-in Ethernet, and a choice of a 230 or 1,000MB hard disk.

Other features include support for asynchronous I/O operation, extended SCSI features such as connect and disconnect, and support for up to 20 SCSI devices. Options include an internal CD-ROM drive and Digital Data Storage-Data Compression 4mm tape backup drive, which is able to store up to 6GB of data. The Workgroup Server 95 is available immediately, and the Workgroup Server models 80 and 60 are expected to be available soon.

Apple (02) 452 8000

New LANdecoder

Force Technology has announced the availability of a new software LAN protocol analyser from Triticom. An official from

SynOptics Boosts IBM, Novell Management

SynOptics Communications has moved to broaden its range of network management solutions by announcing the porting of its Optivity network management system to IBM and Novell environments, and new levels of support for IPX and SNMP.

First released late last year to run on a SunNet Manager 2.0 platform, Optivity is SynOptics' high end network management system and is designed to allow managers to view and manage complex networks as one cohesive system on one screen. Company officials say the product allows managers to diagnose problems that may encompass more than one network element. This means, for example, that managers can trace the path of an information packet from one end-station to another, viewing network interface connections, cabling types, hubs, bridges and routers along the path, they say.

SynOptics' migration of Optivity to NetView/6000 will take place in two phases. Phase one, which is scheduled for the second half of this year, will extend the functionality of SynOptics existing NetView/6000 LattisViews software; while the second phase release (expected early next year), will add comprehensive management capabilities for internetworks, company officials say.

SynOptics say that the porting of Optivity to NetView/6000 is the first step in a cooperative technology effort with IBM to provide Unix-based network management solutions. The company has also scheduled a fourth quarter release of its RouterMan and PathMan network management utilities for NetView/6000.

SynOptics says the new Optivity for NetWare is a 'snap-in' application, fully integrated with Novell's NetWare Management System (NMS) software platform. To emphasise the level of integration, the two companies have even signed an OEM agreement which allows SynOptics resellers to offer the NMS platform (known as NMS Run Time) integrated with Optivity. Available now, the product is priced at $6,490.

SynOptics has also extended support for IPX and SNMP over IPX for existing Ethernet Network Management Modules (NMMs) to its LattisNet System 3000 and LattisSwitch System 3000 hubs. Company officials said that IPX support eliminates the need to use a parallel IP network to manage IPX environments and further integrates SynOptics products into Novell environments. SynOptics SNMP agents can automatically detect whether IP or IPX is being used, they say.

SynOptics Communications (03) 853 0799

the company said the new product is a low priced alternative to a hardware-based analyser. It can track up to 100,000 frames in memory and capture packets with a NIC driver that ensures users receive the maximum level of detail on network activity.

The Ethernet version of the product, LANdecoder/e, works with Ethernet MAC, 802.2 LLC, TCP/IP, NetBIOS, NetWare Lite and NetWare 3.10 and 3.11. The TCP/IP suite decodes IP, TCP, ARP, RARP, UDP, ICMP, TFTP, FTP and Telnet protocols. The Token Ring version, called the LANdecoder/tr, works with NetWare (IPX, SPX, SAP, RIP, error, echo, and PEP) 802.1D, 802.2LLC and 802.5. LANdecoder can also read and analyse captured Sniffer, LANanalyser and NetSight Analyst files, enabling it to also be used to supplement hardware-based analysers.

Force Technology
(02) 971 1000

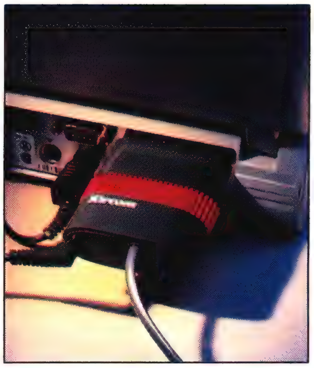
Pocket LAN Adaptor

The new Pocket Ethernet Adaptor III from Xircom features a 'Phantom Power Cable,' is only 75% as big as the previous model, and is able to support all major network operating systems. The adaptor comes in three different models: a 10Base-T model; a 10Base-2 model; and a model which combines both.

The Phantom Power Cable replaces an external power supply by connecting directly from the adaptor to the PC's mouse or keyboard port, while still allowing the mouse or keyboard to be used. The unit measures 8cm by 5.75cm by 2cm, enabling it to fit between the closely placed adaptors on small notebook machines. The adaptor includes preconfigured device drivers that support NetWare, Windows for Workgroups, LAN Manager, LAN Server, PC LAN, LANtastic, VINES, PC-NFS, DEC Pathworks and other network operating systems.

Pricing for the 10Base-T and 10Base-2 models is $650; the combination adaptor that supports both media costs $740.

Wholesale Technology
(02) 368 4800



The Pocket Ethernet Adaptor III is 25% smaller than the old model

New WAN Products

UK-based communications firm Cray Communications has announced its new Series 8000 range of WAN hardware and software products. The new products provide multi-protocol X.25 and Frame Relay Access (FRAD) connectivity for configurations from 1 to 100 ports.

The Series 800 comprises: packet switch exchange software (PSX); three packet exchange 'chassis' which accommodate 4, 8 or 16 cards; and multiple interface cards to support various different protocols.

Each 4- or 6-port interface card carries its own processor and can switch up to 200 packets per second, said officials from Cray. This distributed architecture means the three chassis (the 8325, 8425 and 8525) have respective throughputs of 800, 1,600 and 3,200pps. Software can increase this by a further 50%, according to the officials.

The primary access product to the PSX nodes is the multi-protocol FPX 8295, which can be configured on a per-port basis to support: asynchronous Triple X; 3270 BSC; 3270 SNA; 3270 or 3770 SDLC; 5250 SDLC; IBM SDLC LU6.2 NPSI/QLLC; Bull VIP7700 or 7800; in addition to the 'Syn' based protocols, such as 2780, 3780, HASP, Siemens MSV, Boroughs Sync Poll Select, UTS, Philips ATM, NCR ATM and C01/C03.

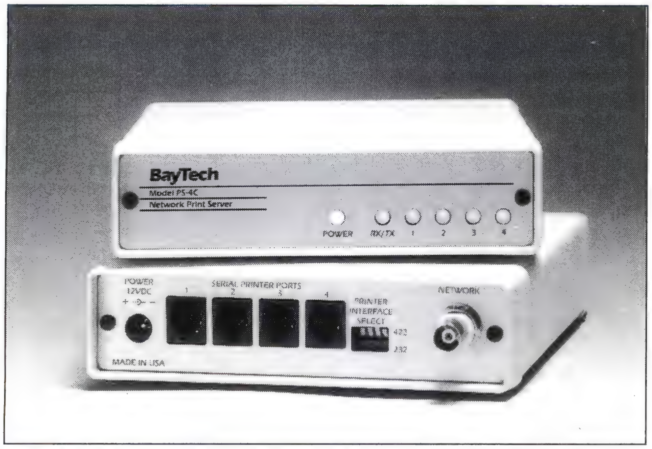
Cray Communications
(02) 451 6655

Motorola GSM

Motorola has introduced a range of GSM mobile phones, to coincide with the launch of the new digital system in Australia. The range includes the transportable International 1000, the International 1000 Mobile carphone, and the International 3200 Gold handheld portable. Features include 11 user-selectable languages for user prompts, battery and signal strength indicators, automatic redial, and international dialling prefix. The units provide 150 minutes of talk time and 24 hours standby time.

Motorola (03) 252 5252

Motorola's new GSM telephones offer 150 minutes of talk time



The PS-4C can service up to 32 print queues on 32 different servers

New Print Server for Novell Networks

The new Print Server PS-4C from BayTech provides the ability to locate the PS-4C and printers anywhere on a NetWare 3.X network, according to an official from BayTech.

The unit supports 10Base-2 or 10Base-T cabling, features four high-speed printer ports, and can service up to 32 print queues distributed on up to 32 servers. BayTech support software gives network administrators the ability to configure all of the print server's parameters and network print queues from one common console, and allows the use of familiar NetWare print service commands, said the official.

Other features include a virtual connection capability for printing directly to PS-4C, and automatic update of queue information. The BayTech official said the product will reduce congestion on file servers and will eliminate the need for a dedicated workstation print server.

Shuttle Industries
(03) 525 2391

Fibre LAN Micro-Transceiver

Data networking firm 3Com has introduced a new micro-transceiver which can connect desktop devices to fibre LANs easily and cost-effectively, according to a company spokesperson.

The ISOLAN 1680 Fibre Optic Micro Transceiver directly connects equipment to the LAN, eliminating the need for expensive and potentially insecure AUI cables. The new ISOLAN is less than a quarter the size of its predecessor, and also offers improved diagnostic indicators which make the installation, monitoring and troubleshooting (including link status, RX, TX collisions and SQE) of LAN fibre connections easier, according to the spokesperson.

The unit's new, highly sensitive receiver circuitry effectively doubles the inter-transceiver/repeater distance supported from the specified 1km to 2km, according to the 3Com spokesperson. The ISOLAN 1680 is priced at $675 for both SMA and ST-type connectors, and is available immediately.

3Com (02) 959 3020

Raycom Token Ring Extender Reduced

ADE Network Technology has announced a price reduction for the multimode 2km distance version of the Raycom M3410 Fibre Optic Token Ring Extender. Formerly costing $2,740, the Extender will now be priced at $2,145.

ADE says the product offers a low-cost means of extending the twisted pair cabling limitations in IEEE 802.5 Token Ring LANs, and will provide complete protection against network downtime due to fibre failure. A redundant configuration of the M3410 can also be used, which will guarantee continuous operation, even if one of the fibre paths is broken, said officials from ADE.

ADE Network Technology
(03) 543 2677

3270 Comms Software

Network Systems Technology has announced the release of new versions of NetSoft's DynaComm/Elite 3270 communications software for Windows, and the 3270/ElitePlus software for DOS. The new versions of both packages offer a range of new and enhanced connectivity features, according to NST.

Version 3.4 of the Windows-based PC-to-mainframe connectivity package DynaComm/-Elite offers concurrent 3270 and LU6.2/APPC communications. An NST spokesperson said the software is the only Windows/-SNA product to offer single-PU 3270 plus APPC over a complete set of network links, such as Coax/DFT, SDLC, 802.2, NetWare IPX/SPX, NetBIOS, Async, X.25 and TCP/IP.

Version 2.2 of 3270/Elite-Plus multisession DOS-based PC-to-mainframe connectivity software product for SNA LU2 environments now has, amongst other new features, a new TCP/-IP driver; support for IBM NetView Response Time Monitor; and mouse support for cursor select commands on 3270 mainframe applications, said the official. Both DynaComm/Elite and 3270/ElitePlus cost $664.

Network Systems Technology
(02) 957 3880

New Fault-Tolerant Disk Array

Micropolis Corporation has introduced the RAIDON LT, a fault tolerant disk array for use with OS/2 and LAN Server-based systems.The system features high performance 3.5-inch drives and software optimised for OS/2, and it also has an expandable data storage capacity which ranges from 500MB to 28GB, said officials from the company.

The modular architecture provides fault tolerance with as little as two-module 500MB duplexed/mirrored configuration, to up to 28GB, by adding one module at a time. Each module is individually equipped with a Micropolis 3.5-inch disk drive, its own power supply and cooling fan, and is hot-swappable in all configurations. Another feature of the product is an 'on-line spare' facility that automatically activates a previously installed standby module, which electronically replaces the failed module. Data is reconstructed on-the-fly and rewritten to the space, providing the user with continuous operation, said Micropolis officials.

Sprinter Products
(02) 977 8155

LocalTalk Links

Australian communications vendor NetComm has announced two new LocalTalk connectivity products from Farallon. LocalPath and PowerPath are software products which enable the connection of LocalTalk devices to Ethernet or Token Ring networks without the need for a specialised router, according to NetComm officials.

LocalPath gives users on an Ethernet or Token Ring network access to up to eight LocalTalk devices, including computers and networked printers. Ethernet users can use LocalTalk services, and Local-Talk-only computers have access to Ethernet services.

PowerPath provides users with a simple way of connecting a PowerBook to an Ethernet or Token Ring network, and runs in the background on a Mac residing on the network. Connection to the host Mac is via a PhoneNet StarConnector LocalTalk connector and extension cable. The PowerBook can then access all network services. PowerPath sells for $299, and LocalPath costs $349.

NetComm (02) 888 5533

Micropolis' RAIDON LT is able to store up to 28GB of data

New Olicom CAU

Force Technology has announced the Olicom Controlled Access Unit, an intelligent hub for Token Ring networks which officials claim is the only CAU available with out-of-band management. The Olicom CAU provides the same information to the LAN Network Manager/NetView as the IBM CAU, and can execute the same LAN Network Manager/NetView commands. It interoperates and is compatible with IBM LAN Network Manager 1.1 and IBM Station Manager 1.0, say Force Technology officials.

According to the company, the CAU connects up to 80 Token Ring network lobes via Lobe Access Modules (LAMs). Up to four LAMs can be connected to each CAU, and up to 20 lobes can be connected to each LAM. The LAM module comes in both STP and UTP versions. The CAU, UTP LAM and STP LAM support 16Mbps and 4Mbps Token Ring networks, and maximum cable length between CAU's can be as high as 400 meters. Company officials claim the unit improves network availability by automatically recovering from most LAN failures, and by automatically bypassing faulty components to ensure the rest of the network is not brought down.

Force Technology
(02) 971 1000

Ethernet Print Server

The LANtronix EPS 1 multiprotocol print server from PowerCorp allows users to use the same Ethernet print server, regardless of whether they are attaching printers to networks using NetWare, AppleTalk, TCP/IP or DEC's LAT protocol, or all of them at the same time, according to a spokesperson. The product makes it easy for users to change their networks, add new network protocols, or move printers from one network to another, said the company official. The LANtronix EPS 1 provides a Centronics/Dataproducts compatible parallel port and an RS423/RS232C serial port on the printer side, and both 15-pin AUI and RJ45 10Base-T connectors on the network side. Printers on the serial and parallel ports can be active simultaneously, and optional transceivers are offered for connection to thin or thick ethernet networks, said the spokesperson.

Features of the EPS1 include data rates to 56Kbps and 40KB parallel, Flash Prom for easy update of protocols, hardware and software flow control, and partial modem control. Pricing is $1,533, with a 6-foot centronics parallel cable included.

PowerCorp (02) 476 3466

The LANtronix EPS-1 handles a wide range of network protocols

Altair Addition

Cray Communications has announced Australian availability of the Motorola Altair Plus II, an addition to its Altair family of wireless LAN products. Improvements to the product include a 70% increase in data throughput, and an Altair Extended SNMP MIB II, which enables full remote monitoring and control of both wired and wireless systems from a single management station.

Cray officials said that the enhanced remote management capabilities of the system allow a wireless extension to be seamlessly integrated with existing Ethernet networks. The Altair

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Plus II operates at 5.7Mbps, an increase over the previous speed of 3.3Mbps. Officials said this makes the system more suitable for bandwidth-intensive applications such as graphics, desktop publishing and database administration, and reduces bottlenecks between PCs, file servers and peripherals. The system uses narrow band RF technology, which Cray claims guarantees interference-free transmission because the frequency band contains exclusive channels reserved for LAN communications.
Cray Communications (02) 948 4274

LANtronix's LXT-FL is especially suited to rugged environments

LANtronix Fibre Transceiver

PowerCorp has released a new LANtronix transceiver which it claims is the smallest fibre transceiver on the market.

The new LXT-FL measures 2.5 by 1.7 by 0.9 inches, and is designed to IEEE 802.3 10Base-FL specifications, and is backward-compatible with earlier FOIRL designs. The unit features five LEDs, switch-selectable heartbeat function, and dual ST-style fibre optic connectors.

The company said the product is particularly useful for harsh environments, or where long distances are involved.

Pricing for the unit is $615, and it is available immediately.
PowerCorp (02) 476 3466

DEC GIGAswitch

Digital Equipment Corporation has announced its new GIGAswitch, a high-performance, industry-standard crossbar switch that is able to interoperate with any ISO/ANSI-standard FDDI device. Digital says the new switch provides migration from Token Ring or Ethernet networks through connection with hubs, bridges or routers containing FDDI ports.

A company spokesperson said Digital also intends to provide a GIGAswitch ATM line card, which will provide a path to ATM networks and allow the attachment of high-performance FDDI switch-based networks to ATM services. A range of communication links will be supported including Sonet, HSSI, and DS3 (T3/E3). GIGAswitch provides the bandwidth needed for network-intensive applications such as multimedia.

Bridging is provided at FDDI line speeds, and customers can increase aggregate bandwidth by adding FDDI ports. A total of up to 22 FDDI ports can be configured on the switch, offering up to 6.25 million dynamic connections per second and 3.6Gbps capacity, a DEC official said.

The base price for the DEC GIGAswitch, including on two-port FDDI line card, is $43,800.
Digital Equipment Corporation (02) 561 5252

Stackable Hub

INC Manufacturing has released a new stackable hub that the company says uses state-of-the-art VLSI design to provide flexibility for a 10Base-T-compliant concentrator, and removes repeater limitations associated with standalone hubs.

This allows network designers to build a standard 12-port RJ45 10Base-T concentrator into a 60-port unit with integral SNMP management, according to INC officials. Each port has full repeater/retiming and hub cascade capability, plus automatic cable polarity detection and front panel system LEDs for measuring power, collision and jabber for each module.

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INC said the hub provides for network growth by a standard 12-port 10Base-T module which can be expanded up to 5 modules via an interconnect cable, allowing a total of 60 RJ45 plus BNC and AUI ports at any time. SNMP management can also be added to the concentrator.

INC Manufacturing
(047) 396 111

Fibre Optic Filters

Queensgate Instruments has announced a new range of wavelength tunable filters, which the company says can operate from -40° to +80°C. The MF100 and MF200 filters have been designed for applications such as the noise filtering of optical amplifiers and wavelength demultiplexing. They are fibre-pig-tailed, open-loop, low voltage, polarisation insensitive designs with low insertion and high return loss, says the company.

The design includes special thermal compensation which allows operation over a wide temperature range at less than 15 volts. The filters, which are manufactured by Fabry-Perot, are used to filter out multiple lasers multiplexed down one single mode fibre, or to reduce noise in optical amplifiers by passing only the amplified laser signal and filtering out the broadband Amplified Spontaneous Emission. The filters sell for around $5,000, said company officials.

Kingfisher International
(03) 764 3933

PowerMAC Drivers

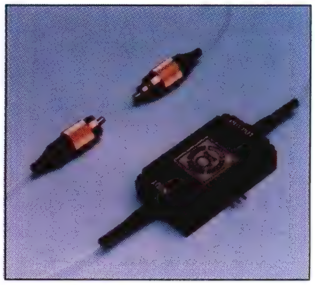
Olicom has released its new PowerMAC drivers for the company's Token Ring products. PowerMAC drivers are designed to increase the performance of high-end servers and routers. Olicom says PowerMAC has a raw frame processing capability of over 30,000 frames per second, and in a real-life environment is able to process in excess of 19,400 fps. The PowerMAC drivers for NetWare 3.11 server ODI are shipping with the Olicom EISA 16/4 Server Adaptor, and will now be included with all Olicom Token Ring adaptors (offering full support for IPX, ODI, NDIS 2.02 and 3.0) by the middle of 1993, according to officials from the company.

Force Technology
(02) 971 1000

Enhanced AppleShare

Apple has released two enhanced versions of its AppleShare software, AppleShare 4.0 and AppleShare Pro, which the company says will give users a wider range of file and print options.

The products are designed to be used in Macintosh-mostly workgroups, and provide support for DOS and Windows clients as well. AppleShare 4.0 will run on the new Apple Workgroup Server 60 and 80, as well as the Macintosh Centris 610 and the Macintosh Quadra 700, 800 and 950. It supports 150 concurrent user logons, with up to 30 highly active users. Apple said it will boost server performance to two or more times that of AppleShare 3.0.



The MF100 filter is able to tolerate a wide temperature range

AppleShare Pro can support up to 200 concurrent user logons and up to 50 highly active users, and is designed for larger workgroups, or workgroups that place intensive demands on the server by moving large data files around the network.

Apple officials said that because AppleShare Pro is built on A/UX, it can offer several features that are not available in AppleShare 4.0, like asynchronous input/output, which allows

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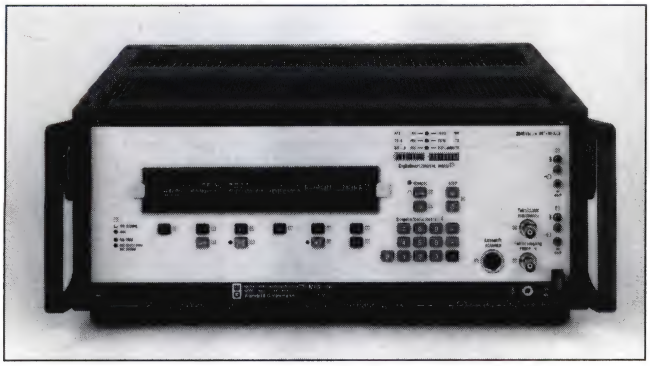


New test modes enable the MFA-16 to be used in the GSM network

reads from and writes to disk to overlap, which leads to performance improvements; significant A/UX file system caching; and the ability to support up to 5,000 open files and 20 connected SCSI devices.

Apple has also announced a new product called AppleTalk Connection for DOS and Windows, which is based on the PhoneNet PC product from Farallon Computing. The product will provide cross platform file and print services for mixed Macintosh and PC workgroups.

AppleShare 4.0 has a retail price of $2,795, while AppleShare Pro will sell for $3,995.
Apple (02) 452 8000

Mobile Frame Analyser

Wandel & Goltermann has added new test modes to its MFA-16 Mobile Radio Frame Analyser, enabling it to handle some new applications on GSM network components and in the GSM fixed network. The SCAN model provides a quick overview of all traffic channels in a 2Mbps signal, and besides channel occupancy, the frame type is also displayed for each channel.

Additionally, the online display helps to locate a service channel that has just been established, said company officials. They said common tests for speech frames (BERT, SYNC, DELAY) are now possible on data and O&M TRAU frames, and measurements can be performed on transparent 16Kbps channels. New transmit signals such as the 'humming sound' (GSM 11.20.5) can be used to test the DTX function of transcoders.

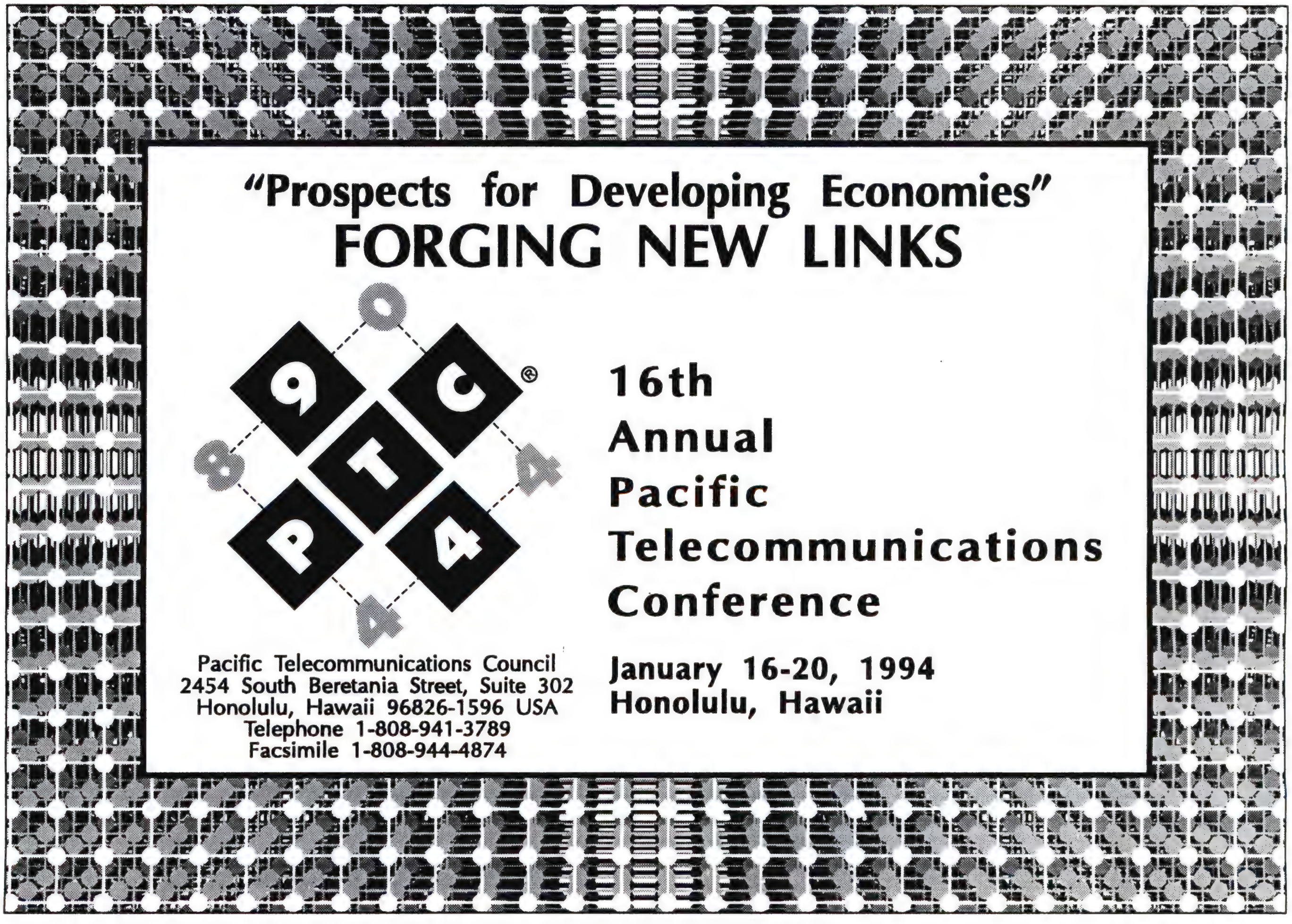
There is a new 'Speech Codec/Digital Interface' card, permitting a voice connection to be set up from the A_{bis} interface to a mobile subscriber via the base transceiver station (BTS), or to a subscriber in the fixed network via the BTS controller and transcoder. Additionally, the monitor mode allows an audible check of all speech channels (16 and 64-Kbps) in the fixed network.

Company officials said the built-in GSM codec is useful for the measurement of transmission parameters on transcoders in conjunction with the PCM-4 Channel Measuring Set, and the MFA-16's V.11 interface provides a submultiplexer function for 16Kbps.
Wandel & Goltermann
(03) 690 6700

16Mbps Filter

Hardie Networks have announced the release of the CT3MF Media Filter, which is used to attach PCs to Token Ring networks using UTP cable. The filter limits the amount of radio frequency interference generated from unshielded cable, and the amount of RFI which can enter PCs through this cable.

The filter operates at both 4 and 16Mbps, and has a nine pin male D-connector at one end and an RJ45 socket at the other.
Hardie Networks
(03) 890 0900



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Windows Router Software for AS/400

Network Systems Technology has released what it claims to be the first Windows-based router software for PC-to- AS/400 connectivity.

Known as the NSA Router for Windows, the product is a high performance PC-based router for use with NSA's Elite/400 range of PC-to-AS/400 connectivity solutions. Elite/400 provides IBM 5250 emulation encapsulated within an IBM LU 6.2 Advanced Program-to-Program data stream. NST officials said the router has been implemented as a LEN (Low Entry Networking) node within IBM's APPN architecture.

They added that the Windows-based installation, configuration and operation make the product very easy to use. Users can launch an AS/400 session by dragging an AS/400 server icon from the router's inactive area and dropping it into the active area with the mouse. PC clients are also able to change AS/400 connections on-the-fly, said the officials.

Network Systems Technology (02) 957 3880

AppleTalk-to-Ethernet

NetComm is shipping the Transware EtherWay EL, a high performance router for interconnecting AppleTalk and Ethernet networks.

A NetComm spokesperson said the product features plug-and-play set-up with automatic configuration. It utilises a Motorola 68000 16MHz CPU, eliminating the need for a separate I/O processor when dealing with more complex network operations, said the official.

Advanced algorithms find the optimum path for transmissions and reduce network congestion, they said. The unit provides multiple levels of security including password protection for each EtherWay device. As well, the unit's zone-level security can selectively restrict access to authorised users only by designating different zones as Blind or Private.

EtherWay EL comes with Transware's Network Manager software, and sells for $2,199.

NetComm (02) 888 5533

SDLC-to-LLC Converter

Andrew's new PathWise/7247 provides SDLC-to-LLC Type 2 conversion, enabling the connection of IBM 3X74, 5X94 and 470X controllers to their hosts via both Token Ring LANs and WANs. Remote controllers co-located with Token Ring LANs and sharing the same host no longer require separate, expensive SDLC leased lines, Andrew officials said.

The product also allows for integration of off-LAN controllers into the local area network, enabling them to be managed through NetView or SNMP-based management systems. PathWise/7427 supports 16Mbps and 4Mbps Token Ring LANs; provides two SDLC communications ports (configurable as RS-232C or V.35); configurable communications speeds of 4800bps to 56Kbps; support for NRZ and NRZI encoding; multidrop support for up to 10 devices; and an SNMP agent, allowing the unit to be managed by systems such as HP's OpenView, Sun's Net Manager and IBM's NetView/-6000. Pricing for the product is $4,750, plus the cost of connecting cables.

Andrew Australia (03) 357 9111

StarSentry Manager

NCR has released version 3.6 of its StarSentry Systems Manager. The product allows network managers to measure the volume of traffic on the network, or on any given line. The Systems Manager traffic summary can be customised, and can be used on any LAN or

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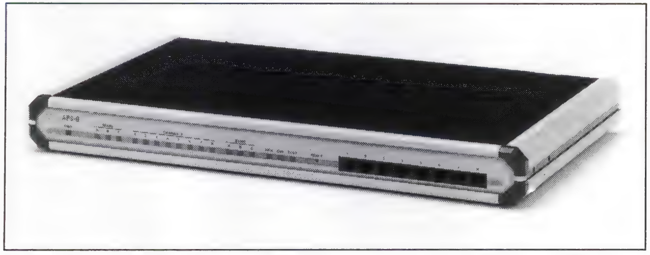
WAN link attached to a SNMP device, such as a hub or router. The product can differentiate between 12 line speeds and classify network traffic into six categories, ranging from low to saturated, said company officials.

Systems Manager 3.6 also automates many alarm responses, and allows network managers to include notes explaining what was done to fix the problem. These notes will be automatically redisplayed by the system if the alarm should reoccur enabling rapid and efficient troubleshooting.

Other new alarm responses in version 3.6 allow the manager to execute Unix commands, trigger further alarms or actions, or reset MIB information.

NCR Australia
(02) 964 8111

New Multiprotocol PAD/Switch from RAD



RAD's new APS-8 supports X.25, Frame Relay, HDLC and STM, and up to 24 async channels can be added to the unit's sync channels

The new APS-8 high performance PAD/Switch from RAD Data Communications can connect up to eight asynchronous channels to three synchronous links, according to company officials. They said the product enables users to build a cost-effective private packet switching network, with an option to access a public network.

Any of the sync links of the APS-8 can be configured as X.25, frame relay, HDLC or STM. Users can add up to 24 async channels by connecting off-the-shelf RAD statistical multiplexers directly to one or two of the APS-8's synchronous channels, said RAD officials.

The synchronous link operates at data rates of up to 2Mbps. The size of the link packets can be up to 4,096 bytes, and the channel data rate is selectable from 75bps to 19.2Kbps.

Multi-session is provided on each async channel, and the unit allows configuration, monitoring and diagnostics from any point in the network through an X.25 address, said officials.

Dataplex (03) 210 3333

Handheld Power Meter

A new handheld optical power meter from Graseby Optronics automatically knows when to measure watts, foot-candles, or any other optical unit, according to a spokesperson from the company.

The GO352 features intelligent detector heads that are able to store calibration data and communicate it to the control unit. The large, 11-segment backlit liquid crystal display then provides the measurement value and correct units.

The GO352 is able to make photometric, radiometric or fibre-optic power measurements by simply changing the detector head, the officials said. It can run off internal rechargeable batteries or line power, and analogue output is standard.

Kingfisher International
(03) 764 3933

PC-Based Test Software

Wandel & Goltermann has released the PTS-106 software package that allows users to perform tests on digital links or

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Data communications testing on all common interfaces such as RS232, X.21 etc is also standard, allowing testing from 50bits/sec to 2.5M bits/sec.

The crisp super-bright display presents an intuitive user interface, and provides a graphical display of up to 72 hours test results. Applications software, GPIB, and Battery pack options are now available for greater flexibility.

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multiplex equipment from a PC. Company officials said that the PF-6 Error and Jitter Test Set can be performed during the installation, acceptance and troubleshooting of digital links and multiplex equipment, and the results are displayed in clear tables or graphics to help isolate important results in a mass of test data.

The software allows simultaneous display during test procedures with 1s and 1h resolution. Features include: measurements on framed and unframed signals from 48Kbps to 175Kbps; all PF-6 error measurements (bit, block, CRC, FAS, slip); all alarms recorded by the PF-6 (no signal, no sync, AIS); histograms (error evaluation and G.821); and printer drivers for Epson or HP LaserJet printers.

The company official said another advantage of the software is that once defined, instrument setups and test sequences remain in the database for access under a given name, minimising errors and reducing the need to repeat time-consuming tests.

Wandel & Goltermann (03) 690 6700

Multimedia Hub

Data communications network and equipment supplier, Dataplex, has just released SpiderNet, which the company claims is the first multimedia intelligent hub available for AS/400, 3270 and Token Ring LAN environments. SpiderNet supports networks operating over structured cabling configured in an active star topology over UTP, STP, FTP, fibre optic, coax and twinax. It supports a combination of up to 192 Token Ring devices, up to 70 twinax devices, or up to 128 3270 devices.

The system's modularity allows for the connection of up to two S/3X or AS/400 systems simultaneously, either local or remote, and up to 12 independent Token Rings, says a Dataplex spokesperson.

The company says SpiderNet is entirely fault tolerant, and faults like streaming devices or shorted cables are easily detected and isolated without disrupting other devices.

Dataplex (03) 210 3333

The SpiderNet hub supports Token Ring, twinax and 3270 devices

LAN Manager 2.2 Announced

Software giant Microsoft has announced the latest upgrade to its LAN Manager network operating system.

With new features for local and wide area networking, company officials say LAN Manager 2.2 is designed to complement Windows 3.1 and provide easier management and connectivity for large Windows environments. The improvements are those most requested by existing LAN Manager users, say the officials.

For Windows users, new features include a Windows network administration program which provides administrators with with a unified tool for managing multiple servers from a Windows desktop. In addition, all aspects of server management can now be administered remotely over a modem using Microsoft Remote Access Services. Version 2.2 also includes Windows Network Application Starter, which allows users to run applications off the network without having any knowledge of network use; LAN Manager Print Station, a terminate-and-stay-resident program, which allows any DOS or Windows user workstation to be designated as a print server; and TCP/IP and DLC protocol support for Windows for Workgroups.

For wide area networking, the new LAN Manager includes TCP/IP extensions which allow administrators to maintain a unified database of users, passwords and access rights for a group (domain) of servers. Administrators can also now treat large workgroups spread across more than one physical location as one domain. The extensions also allow users to span LAN Manager domains across routers. Also included for wide area networking, the new Microsoft Remote Access Services version 1.1 provides support for remote dial-in to X.25 networks.

Company officials said that for closer integration with IBM environments, LAN Manager version 2.2 includes OS/2 2.0 workstation support.

Microsoft has also changed its pricing policy to coincide with the new release. Workstation licences and technical checkpoint limits to the number of clients able to connect to each server have been abolished and LAN Manager pricing is now per server only. Available by the end of the year, LAN Manager 2.2 will be priced at $3,100.

Microsoft (02) 870 2100

New Features for Reflection Software

Megatec has announced powerful new DEC VT420 terminal emulation features have been added to the two of the Reflection for DOS terminal emulation packages.

Version 4.3 of Reflection 2 (text terminal emulator) and Reflection 4 (ReGIS and sixel colour graphics terminal emulator) will support rectangular area operations, macros and the copy-and-paste function of the VT420 terminal.

Both packages already support such VT420 features as display-page memory and displaying from 24 to 49 horizontal lines on the screen when used with an EGA or VGA monitor, said officials from Megatec.

Reflection version 4.3 will emulate two new terminal types — SCOANSI and BBSANSI. Other enhancements include support for the Hewlett-Packard DeskJet 500C colour graphics printer, and VESA choice for displaying 132-column text.

Reflection 2 enables users of PCs to run any application written for Digital's VT320, VT220 or VT102 terminals. The package reproduces familiar terminal features such as special character sets, user-defined keys, and double-high and double-wide characters, according to Megatec officials. Users are able to display up to 132 columns of text at once on their monitor using a video adaptor or an EGA/VGA card, the officials added.

Reflection 4 includes all the features of the Reflection 2 package, and adds complete emulation of Digital's VT240, VT241 and Tektronix 4014 terminals. Version 4.3 of both products is available immediately, and pricing is $340 for Reflection 2, and $485 for Reflection 4. Upgrades for both products sell for $195.

Megatec (03) 874 3633

SunNet Manager Support Upgrade

ADE Network Technology has released version 3.00 of SunNet Manager Support Package. The package allows users to manage and monitor network application technology (NAT) devices from Sun workstations, via Sun's SunNet Manager package, and features support for the new RMON MIB standard, according to an ADE representative.

The SunNet Manager Support Package provides an easy-to-use graphical interface for the management of NAT Ether-

Freeset provides mobile communications around the office or factory

Meter using RMON MIBs, said the ADE spokesperson. A graphical interface is available for six MIBs: Host, History, Matrix, Alarm, Event and Statistics.

A reporting function allows the user to view, save and print real-time statistics from the NAT EtherMeter Zoom, Top10, RMON Statistics, RMON Host and RMON Matrix applications.

The package also allows RMON table entries to be saved and reloaded, and offers SNMP MIB support for NAT's local and remote Ethernet bridges, local and remote EtherMeters, and remote IP routers.

ADE (03) 543 2677

New Additions to Megatwistlan Range

MM Cables has added three new products to its range of Megatwistlan cables for local area networking. Screened Megatwistlan 4 and Screened Megatwistlan 24 are high grade Category 5 Shielded Twisted Pair LAN cables for voice and data transmission up to 100Mbps. Megatwistpatch is a four pair Unshielded Twisted Pair modular patching cable which is fully compatible with RJ45 connectors.

All the products comply with AS3080, IEEE 802.3, 10Base-T, E1A/T1A TSB 36 Category 5, and all have Austel approval, according to a spokesperson from the company.

MM Cables (02) 600 0777

Cordless PABX

Ericsson has announced Austel approval for Freeset, which the company claims is the world's first business cordless PABX system. The new product has been developed and manufactured by Ericsson, and uses handheld telephones that operate as cordless extensions to the PABX, eliminating the need for conventional fixed phones and giving users complete mobility around the workplace.

According to Ericsson, Freeset can interface to many existing PABXs, and supports up to several thousand users at a single site. The handsets weigh just 220 grams and are small and compact enough to be carried in a pocket, yet offer the full functionality of conventional office telephones, including conference calling, said the company.

It added that the voice clarity is on a par with standard PABX systems, so callers are unable to distinguish between a Freeset call and one originating from a traditional PABX.

Ericsson (03) 487 5700

HIPPI Extender

Kingfisher International has announced the new Model 1210 fibre optic HIPPI extender from Broadband Communications Products. The new model is fully compliant with the latest ad hoc Serial HIPPI open standard for supercomputing networking, according to officials from the company.

The new product allows single-mode optical fibre HIPPI interconnections between supercomputers and peripherals to more than 10,000 metres. Other features include a bit error rate (BER) of less than 1 x 10^{-14}, optionally redundant power supplies and a local/remote loopback diagnostic function, said the officials. The unit is able to support two separate 800Mbps (100MB) HIPPI channels, giving an effective data transfer rate of 1.6Gbps (200MB) per extender chassis. Status, diagnostic and fault signals are output from the 1210 via an RS232 port, said the officials.

Kingfisher International
(03) 764 3933

10Base-T Modular Repeater Hub

Toren Computer has announced an addition to its MultiNet modular hub range. The Lannet LER-T40 repeater hub features advanced SNMP management capabilities and offers 40 10Base-T ports as well as a 10Base5 AUI interface.

The 19-inch rack-mountable unit is available in a managed or unmanaged configuration. The unmanaged hub can be upgraded by inserting a management module into the management slot in the hub, a spokesperson from the company said.

SNMP management allows the monitoring, control and gathering of statistics down to the port level. The Lannet LER-T40 supports UTP links of up to 160 metres on Level 3 cable, and each port has a diagnostic LED providing link status information. The AUI port can connect directly to a coax backbone or via an LER-25 transceiver to the synchronous fibre backbone of a MultiNet network, according to officials.

Toren Computer
(03) 242 5050

3Com Discount Offer

3Com Corporation has announced price reductions on its LinkBuilder FMS TP twisted pair stackable hub and accompanying network management software products.

The price of the LinkBuilder FMS TP hub will be cut by 10%, to $1,715. The hub can be seamlessly interconnected with up to three FMS twisted pair or coaxial hubs to form a single logical repeater, managed through a single user-installable management module inserted into one hub in a four-hub stack, said the 3Com spokesperson.

3Com's ISOView network management system software has been reduced from $5,170 to $1,110. The company said ISOView provides a full range of management features including status and control functions, statistical information, graphing and alarms.

3Com is also offering a price reduction on its 12-port unmanaged ISOLAN TP hub. The new product will be reduced by 22% to $1,200. All price reductions are available until the end of June only.

3Com (02) 959 3020

The Lannet LER-T40 repeater hub offers users advanced SNMP management capabilities and LEDs indicating link status

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C C I T T

The Pacific Perspective

Pacific
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Multimedia and the Happy Collision of Planets

In April, PTC participated in a special international conference held in the Canadian Rockies splendour of Banff, Alberta, on the subject of multimedia communications. It says a bit about our multimedia world that most participants were from the telecommunications and information technology sectors. While Banff is best known in the communications world for its annual international television programming festival, it appears that the McLuhanesque world of intertwined, converged media and message still remains in the future. Few broadcasters or programme producers were present.

But the Banff multimedia conference was not short on ideas. While the reality of convergence is not omnipresent yet, those who attended PTC'93, the 15th Pacific Telecommunications Conference, will have seen that converging technologies are, inexorably, leading to a different, more evolved, telecommunications environment. What this means, in a word, is multimedia.

Multimedia is not just new or newly-applied technologies. As John Kelley of Canada's DVS Communications said: "We don't just need new technologies, we need new thinking." His enterprise is developing multimedia teaching systems that attempt to replicate the learning processes of the human brain. Many such applications and concepts are in the works, and the powerful combination of a new generation of computing capacity and digital telecoms will guarantee the realisation of at least some of these exciting new media.

As discussed in past columns in these pages, we are only at the very beginning of a philosophical re-evaluation of the regulatory frameworks necessary for a converged, multimedia world. As the attendance at Banff illustrated, the telecoms/technology and broadcasting/entertainment 'planets' remain unnecessarily and artificially apart.

> *". . . we are only at the very beginning of a philosophical re-evaluation of the regulatory frameworks necessary for a converged, multimedia world."*

One possible breakthrough to this division may come about when the artificial barriers between cable television and telecommunications provision are laid to rest. Where regulation (or deregulation) permits, such as in New Zealand and the UK, one sees a heavy interest and investment on the part of telecoms entities in cable systems. The reverse is also the case: Unitel, Canada's competitive carrier, was until recently 50% owned by Toronto-based Rogers Communications, Canada's largest cable operator. Another Canadian cable company, Videotron, has developed the world's most advanced interactive cable system in Montreal — with telephone service just about the only service not on offer to subscribers (in some of their UK systems, Videotron does offer telephony, as do most of the small UK cable operators, many of whom are owned by large telecom entities such as the US RBOCs).

With the acquisition of music recording companies and Hollywood studios by Japanese giants Sony and Matsushita, one sees a greater synergy between consumer electronics and the entertainment industry. This is not quite a bridge between two worlds, however. After all, the consumer electronics-broadcast media connection is as natural and complementary as the telecoms equipment supplier-carrier connection.

Nor are such connections particularly novel. The multimedia environments of the 1930s and 1940s had companies such as RCA, Philips, AWA, and CBS producing everything from radio programmes, to records, to the radio stations, to the radios themselves. Likewise, telecoms entities almost always produced their own equipment or purchased from monopoly or oligopoly providers (in which they usually had some ownership interest).

The situation today, of course, cannot really be compared to the nation-centered telecoms worlds of yesteryear. But today's telecoms environment remains broken into the separate domains of entertainment media, computing, and telecoms, with considerable grey areas in between. For several years, the Massachusetts Institute of Technology Media Lab (and, more recently, an excellent survey in *The Economist*) has used charts depicting 'spheres of activity' to show how these separate sectors are drifting more closely together — how the grey areas are getting larger and fading into one another, and how the core areas of entertainment media, computing, and telecoms must now take the existence and influence of one another into consideration.

At one level, this seems obvious and inevitable. At Banff, Dr Shobha Das of India's CMC Limited put forward the case that multimedia will lead to the reintegration of the today's fragmenting social trends and lead to a new, holistic sense of world community. I can hear some readers groan — and I admit the phrasing connotes images of what well-known American satirist PJ O'Rourke calls the 'sandalistas' — but the interactive character of multimedia does imply a more aware, participatory state on the part of the media consumer.

Consumers may find it easier than many of us in the industry to adapt to the new multimedia world. To the consumer, the ease with which new technologies may be employed will render the impressive technology largely transparent. Content will be everything — just as picking up a book does not require a knowledge of typesetting and binding. After all, if multimedia is as complicated as, say, programming most VCRs or deciphering most car stereos, than we are in big trouble and our brave new ear will go the way of Telidon, residential videophones, and other 'sci-fi solutions.' The challenge to the service provider and equipment manufacturer is to maintain a consumer-focus.

Will multimedia lead to a happy confluence of the telecom, computing, and entertainment media planets? It would appear so, and that progress in this direction is inevitable. This was apparent at Banff just as it was at PTC'93. But few individuals or companies are fully exploiting existing technologies, much less pioneering new applications. Perhaps the rapid evolution of technologies is, in itself, a disincentive to becoming too committed to specific technologies and their uses. Most multimedia technologies and their applications require a substantial knowledge and familiarity with either telecoms or computer technology or both.

Nevertheless, those pushing forward in this field are keenly aware of the need for transparency; that using multimedia must be as easy as picking up a book or 'dialling' a telephone. When that day arrives, then the planetary boundaries between computing, telecoms, and entertainment media will be removed and all will be, er, cosmic oneness (but not for the regulators!).

James Savage is the Assistant Director, Pacific Telecommunications Council and Editor of the Pacific Telecommunications Review.

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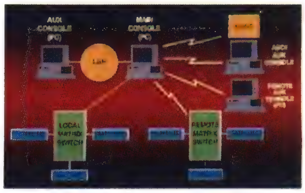

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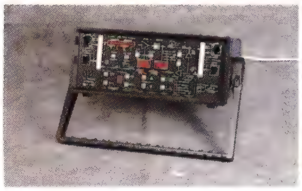

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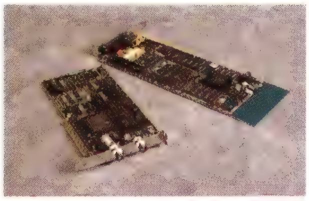

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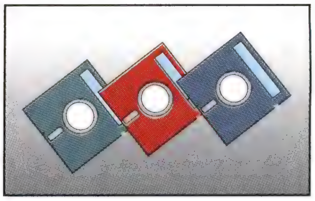

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ATUG AUSTRALIAN TELECOMMUNICATIONS USERS GROUP

From the desk of the Executive Director

Directory Negotiations Bear Fruit

Telecom's announcement of significant reductions in its STD rates last month was further welcome evidence that competition lowers telecommunications costs for users. And that is why ATUG has worked so hard to have competition introduced. Our aim, then and now, is sustainable competition. As we have said before, no one could possibly want a repetition of what happened to competition in the airline industry; so, with that proviso, congratulations all round, and particularly to Telecom.

At the same time it needs to be realised that this is just the beginning. Competition has a long way to go and needs nurturing. The starry-eyed who think it has all been done and say that competition in telecommunications is now working well are not living in the real world. There are still significant areas where there is either no competition at present, or no prospect of competition emerging in the immediate future.

While competition is encouraged as far as the regulations are concerned, the fact is there are often economic factors which deter potential competitors from risking their shirts on ventures which have high entry costs. One of these theoretically competitive services is that essential tool to make telecommunications work — the telephone directory.

Business Funds White Pages

Telecom's licence requires it to provide a White Pages directory, and, in theory, anyone can, and some do, produce directories. However, we know of no one who is prepared to provide and distribute a competitor to White Pages; so it remains, effectively, a monopoly.

Even though consumers do not pay for their directories, only the very naive could believe that they are free. Someone pays.

The White Pages organisation in Telecom is a separate cost centre which pays its parent for the information to go in the directory. The White Pages group charges users for bolding, advertising and additional entries; this income offsets the costs for printing and distributing 'free' copies to everyone. The requirement is to break even.

Business users who have provided most of the income through their additional entries, have long felt that their leasing of a line or service should also entitle them to a 'free' entry for each number allocated. Bolding or advertising is accepted as a reasonable business cost. It has been the charges for dedicated fax lines, additional lines at the one address and mobile phone numbers which are considered unfair.

The official answers, from the Minister down, are that directories are open to competition and that, to include extra lines and other services would make directories so big that they would be unwieldy. We did not believe it. If you paid for it, an entry would be accepted, so size should not be an issue. The real reason is that no one wanted to include in the cost of a service a component for a directory entry, and no one wanted to stop the distribution of 'free' directories to domestic users.

A Successful Negotiation

So ATUG took this up with Telecom, and we are pleased to announce that Telecom has now reviewed its White Pages policy so that, in its simplest form:

'An entry containing the first appearance of a telephone number can be listed free of charge in the directory covering the area in which the service is listed. This free listing will include the customer's name (either a personal or registered business name), the street address at which the service is connected, and the telephone number allocated to the service. Business customers may also list a recognised occupation.'

Furthermore, additional entries (up to 30 characters) for, say, a fax notation, will now cost $30 p.a. per line, rather than the $94 p.a. which is charged at present.

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This revised policy will start to take effect from the first 1994 series of Telecom White Pages directories, beginning with Melbourne. ATUG will be publishing the revised policy in full for its members. In the meantime, some points can be made:

Firstly, in the month of ATUG'93 it is pleasing to have two outcomes of ATUG's efforts providing benefits to users. Secondly, Danny Curran, the White Pages National Manager, and Telecom are to be congratulated for negotiating the issue and taking account of users' concerns. Thirdly, this is far from the end of ATUG's efforts and we will go on working to achieve benefits for users generally.

If the users, through ATUG, can continue to work as well as this with the carriers, to resolve issues which are of concern to us, we are going to make much better progress than in the old days of confrontation and gains measured in inches rather than kilometres. That is not to say that this White Pages issue was resolved with the alacrity we sought — it wasn't. But the portents are good.

Wally Rothwell

Wally Rothwell
Executive Director

AUSTRALIAN TELECOMMUNICATIONS USERS GROUP

Users Approve of Optus Contingency Plans

Users have generally agreed that Optus' contingency plans have been successful following the loss of the B2 satellite six months ago.

Prior to the unsuccessful launch of the new Optus satellite, users had expressed their disapproval of having to undertake short-term reconfiguration of their transmission and reception facilities. Nevertheless, the loss of the satellite forced users to accept Optus' contingency plans.

Previously, Optus had planned to extend its satellite transponder availability by moving the A3 satellite to the location of the A2 and transferring all A2 and A3 services from A2 to A3. Last month, the A2 satellite was put into inclined orbit to extend its life.

A replacement satellite for the lost satellite has been promised by Optus' Chief Operating Officer, Ian Boatman. According to the carrier, the continued availability of the A2 is expected to "provide contingency for any delay on the B2 replacement satellite."

Plans Resurrected

The contingency plans were originally discussed by ATUG in a meeting with the B2 satellite users in October last year following a proposal by Optus to make the rearrangements while placing the B2 satellite into a storage orbit. The meeting discussed the effect of Optus' rearrangements of satellite services.

In the meeting, users had expressed their concern regarding the costs and inconvenience that would be involved in using the A3 satellite as planned by Optus.

Ironically, the loss of the B2 satellite left users with no option but to accept Optus' contingency plans. At the time, Boatman said that the contingency plan would maximise the availability of satellite transponder capacity to service existing and anticipated new business until the replacement for B2 was in commercial service.

According to the users of Optus' satellite services, the carrier has kept them up to date with its developing contingency plans. The Australian Defence Force and the Commonwealth Bank of Australia are two users who did not have any problems with Optus' plans.

Queensland-based Q-Net Australia also recently announced its satisfaction with the plans.

According to Q-Net's Project Manager, Linda Stewart, who was appointed to oversee the move of the Q-NET VSAT network from satellite A3 across to satellite B1, every earth station had been re-crystalled to meet the new frequency plan. This is a procedure which requires planning and simultaneous execution to ensure that users are not inconvenienced.

Q-Net Australia's Managing Director, Rick Strangman, said the company had to move the network across to satellite B1 by April 6th, the scheduled decommissioning date for its former transponder. As a result, more than one hundred outstation dishes have now been repointed towards the new satellite.

The exercise also included a frequency change and the repointing of the master earth station, which is the central transmit and receiving point in the satellite network.

According to the users, the costs of the satellite services have not changed in the sense that the service is not the same. For example, the Department of Defence has had to adjust its costs because the service being used currently is not the same as that used in the past. However, this has not caused any problems, and in fact, the Department is 'very happy' with the carrier's service.

The Civil Aviation Authority is another user that had to use Optus contingency plans following the loss of the B2 satellite. It had to make the transition for 108 sites in 10 days. According to the aviation satellite system manager, Rolf Goslin, the Authority is able to use more services now. "Our costing is 'locked in' with a lease agreement with Optus which runs to the year 2000," he said. Nevertheless, the Authority will be evaluating this arrangement once the B series configuration is set.

AAPT Slams Costs

One user concerned over the costs of the new arrangement is AAP Telecommunications. The service provider would have preferred to have continued to use the A3 satellite. According to AAP Telecommunications' General Manager, Barney Blundell, the cost of satellite services in Australia is generally too high. "In fact, they are double compared to the rest of the world and unless the price comes down then the market will erode — apart from television applications," he said.

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Outsourcing as Part of the Planning Process

"The decision by an organisation to outsource any area of telecommunications services is a business and strategic decision that can only be made when all of the issues are clearly understood."
— Dr. Walter Green, BHP Engineering, and Mercer Laidley, Director of Consultel Australia.

ATUG members in Western Australia were recently warned to evaluate strategic planning issues before opting for assistance from outsourcing organisations. The advice was given by two Australian outsourcing specialists, BHP Engineering and Consultel Australia.

Users tend to consider outsourcing their telecommunications services to remove the complexity of providing such in-house services and, at the same time, to provide a focus on service delivery and a formal interface that defines responsibility.

According to the companies, the decision to outsource telecommunications services should be made after strategic planning issues have been evaluated.

These issues may be grouped into three: organisational, operational and financial. The organisational issues that should concern management during the decision process are whether the structure of the current telecommunications department relates to the core of business and whether the skill base is suitable compared to the skills available from an outsourcing organisation.

The operational issues include comparing the company's goals with current telecommunications strategies and technology used with emerging telecommunications technologies. The financial issues to consider involve the cost of providing in-house telecommunications services; the return on investment over a specified period; and the efficiency of outsourcing compared to current provision, including accountability for services consumed.

Both companies said it was important for the outsourcing strategy to provide management with the confidence that the information base is complete, that the option analysis is thorough and that the issues, benefits and risks have been competently defined.

Telecommunications Services

The telecommunications services that an organisation may consider for outsourcing include:

- Networks
    - — Voice;
    - — Data;
    - — Mobile Radio;
    - — Transmission; and
    - — Telemetry.
- Applications
    - — Voice Mail;
    - — Call Accounting;
    - — Electronic Mail; and
    - — Software.

The functions of a typical telecommunications outsourcing organisation, should include:

- Facilities management (voice, data, transmission);
- Maintaining standards;
- Forward planning and budgeting;
- Design;
- Implementation;
- Operations; and
- Maintenance.

Outsourcing Contracts and Relationships

A key feature of any outsourcing contract is an understanding by the client or user that it is not a supply and install contract where performance liability and factors are the only issues, but should include the management and control of a long-term relationship. An outsourcing relationship is, by definition a long-term one, during which techniques and products may change. Thus, an outsourcing contract should specify how the provision of services are to be managed, and the general objectives to be achieved.

The management function should cover the following minimum set of functions:

- The structure of the project teams for both users and contractor with ultimate control vested in the user or client;
- Objectives should be specified in such a manner that they can easily be defined numerically or objectively, for example, 'adequate grade of service' is too vague, whereas '99.99 percent of availability' is more easily defined and measured;
- Agreed procedures for changing the scope and objectives as well as modifying significant milestones;
- The responsibilities and procedures of defining 'how' the objectives are to be met; and, finally
- The agreed procedures for undertaking the risk analysis and risk management and setting parameters for risk reduction programs.

Remedial Action Plan

Many contracts for long term relationships do not provide adequate methods of dealing with the non-performance of equipment or software. Non-performance covers the complete failure of a system, to varying degrees of user dissatisfaction.

The remedy evaluation should allow a 'What-If' analysis and a mean apportioning responsibility, for example, 'if a client wishes to follow or use a high risk approach then some of the responsibility must be apportioned to the client' or 'the degree of responsibility when the client wishes to purchase equipment for the contractor to integrate.' The apportionment of responsibility becomes almost impossible if inadequate risk management practices are used.

Pricing

The structure of the pricing of each component of the project should be clearly defined, for example, on a lump sum or time and materials basis. Percentage mark ups and lump sum loadings (between 7.5 to 15 percent) should also be specified.

To cater for price decreases as well as increases the pricing structure should include an escalation formula and an agreed set of CPI indexes.

Liability

Blanket liability clauses often lead to less than optimal value of performance criteria. Liability clauses should cover those areas which cannot be covered by the Remedial Action Plan and should cover at least the Project Objectives defined earlier in the contract. Specific liability formula should be defined for each major objective with sensible caps on liability limits.

Termination

All contracts must terminate at some point, and there should be an agreement on the provision of adequate information to enable the user to continue to manage and use the system. This should include the use of copyright, patents manufacturing and production information where applicable.

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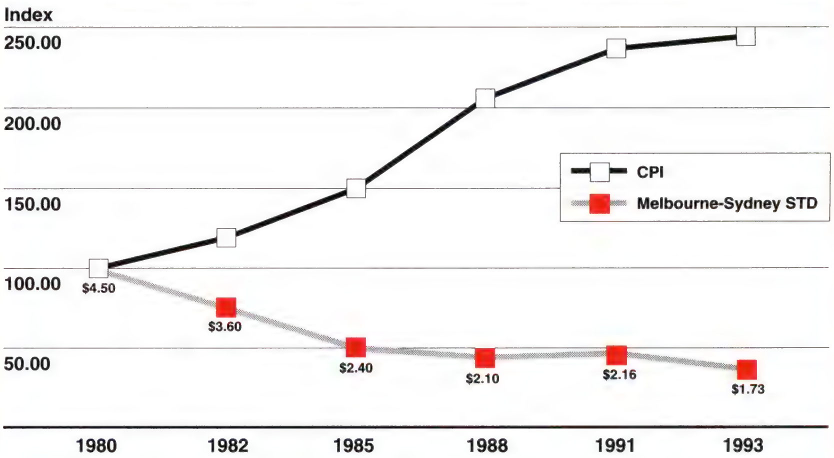
Telecom Drops STD Prices by 2%

Businesses who are large users of STD services are the beneficiaries of Telecom Australia's reduction in STD prices from May 6, 1993. The drop in STD prices follows the carrier's introduction of a new calling rate between capital cities as well as a reduced rate for STD calls within the 165 to 745km band outside the capital routes.

According to Telecom's Manager for corporate policy and affiliate relations, Jeff Portelli, the fall in the price of long distance phone calls has been significant since 1980. For instance, in 1980 the price of a Melbourne-Sydney day rate call was $4.50 for five minutes. The cost for the same five minute call is $1.73 following the introduction of the 'Intercapital Rate' for calls between capital cities.

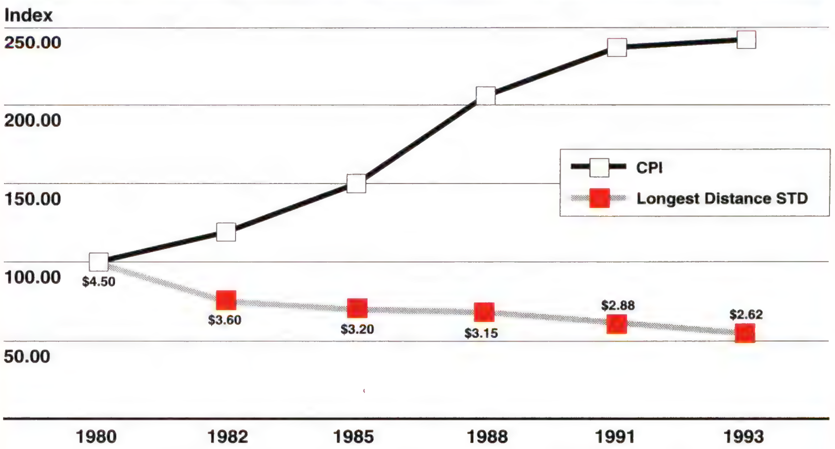
Telecom's new prices cut the cost of telephone calls by up to nine percent on the day rate and up to seven percent on the economy rate 'near capitals.' However, the reduced rate for STD calls within the 165 to 745km band outside the capital routes is a drop of two percent only.

STD Prices 1980-1993 CPI vs Melbourne - Sydney STD*



* nominal prices - maximum price for a 5 minute call at the Day Rate

STD Prices 1980-1993 (Non-Intercapital) CPI vs Longest Distance STD*



* nominal prices - maximum price for a 5 minute call at the Day Rate

Telecom Rediscovers Discovery

Users of videotex services in Australia will find that Telecom has rediscovered its own Discovery service as a viable business venture among the hysteria for interactive video services such as Pay TV.

Earlier this year, media reports were critical of Telecom, saying that the carrier was trying to squeeze information providers out of the market while other reports had it that the service was quietly being sold to companies such as CompuServe Pacific, Info-One International and the AAP Group. However, last month, a decision was made by Telecom's General Manager for Enhanced Services, David Rolls, regarding the future of the Australian videotex service. "We looked at how the service fitted into Telecom's strategy," he said.

Apparently, there were a number of offers made for the purchase of the service from Telecom, but due to non-disclosure agreements, Rolls was unable to elaborate.

Such media reports worried some ATUG members who had invested many hundreds of thousands of dollars over the years in developing services to run on the videotex service. Members were left not knowing whether the service would be closed down or whether it was going to be absorbed by other departments within Telecom.

There were also questions raised as to why the matter was being kept under wraps rather than taking the normal course of action which required a tender process to be undertaken if the service was to have been sold to third parties.

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Users Concerned

Similarly, users of the service were also concerned. They wished to know if the services provided on Discovery would continue and, if so, whether they would continue at the same price. One user in the insurance industry said Discovery proved to be a useful marketing tool but it did have "some anomalies" and it could do with improved technology. Another user agreed, saying "it has the potential to become a better service."

ATUG member Paul Budde is one believer in the service's potential.

Budde was involved with Discovery in its early days, when it was called 'Viatel,' and wrote its first marketing plan. According to Budde, Australia has missed out on the evolution of videotex, services but the renewed interest in interactive TV with mass market applications places videotex and audiotex services in the forefront of the development of new services locally.

The Discovery Service

The service has been under the management of Telecom's subsidiary Telesoft Communications for the last three years. In its heyday, the service boasted 36,000 subscribers, however, in recent times, the number of subscribers has dwindled down to about 12,000.

The reasons for the decline in Discovery's popularity, according to Telesoft's former Managing Director, Maureen Murphy, included the recession, a lack of marketing on behalf of individual service providers, and also poor technology.

In addition, some of the "less serious" service providers did not update information regularly, and thus users lost interest.

Today, the services that may be accessed on Discovery have been divided into a number of categories. They include messaging, company information, government and legal, news and weather, directories, Moneywatch, online banking, racing, bulletin boards and conferences, telesoftware, travel, leisure and shopping.

Some of the service providers include the Australian Securities Commission, Radio Rentals, the Australian Bureau of Statistics and the Commonwealth Bank.

The Future

Following Telecom's detailed examination of the purchase proposals for the Discovery service, Telecom Enhanced Services will now retain and revamp the service.

According to David Rolls, the service will be enhanced technologically and will be developed. He said export plans involving broad electronic service networks had created an environment in which the best medium term decision was to continue to re-establish Discovery's online information, transaction and entertainment services.

"The Discovery user base is now growing again steadily after a period of decline. Simultaneously, costs have been cut dramatically. We intend to retain and build on this base," he said.

Toula Mantis

CALENDAR

June

1-2 **Demystifying LANs**, Gazebo Hotel, Sydney. This seminar aims to give CIOs, MIS Managers and Data Communications Managers a thorough overview of local area networking technology and a solid foundation in networking fundamentals. It covers local area networking topologies; cabling and access methods; protocols and architectures; the role of hubs, bridges, routers and gateways; network operating systems; and the use of network management tools. The issues of security and network reliability will also be discussed, The course will be conducted over two days. Fee: $994. Enquiries — MTE Tel: (02) 261 5555 Fax: (02) 261 5959.

9-11 **World Trends in Telecommunications Corporatisation and Privatisation**, Taipei, Taiwan. The Pacific Telecommunications Council is holding this seminar, during which delegates can learn about the experiences of telecommunications organisations and international corporations working in the region. Participants will be updated on regulatory trends and policy shifts in Taiwan and the East and Southeast Asian and Pacific countries. A key feature of the event will be specially arranged site visits to Taiwan's state-of-the-art telecommunications facilities. Fee: $US50. Enquiries — PTC Tel: +1-808-941-3789 Fax: +1-808-944-4874.

21-23 **EDI in the Public Sector**, Hyatt Hotel, Canberra. This seminar will provide attendees with a sound understanding of government EDI policy and initiatives. Also covered are issues such as cost/benefit analysis of EDI implementation, infrastructure options for networks and corporate gateways, and the security issues that need to be addressed. Two-day conference and workshop fee $1,795; conference only $1,295; workshop only $795. Enquiries — IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

21-23 **Wide Area Networks**, Hotel Inter-Continental, Sydney. This conference discuss the important issues of functionality, comparative WAN capabilities and WAN cost and application within an organisation. Topics covered include: the evolving SNA WAN; a comparison of data architectures; interconnection to LANs; mixing private networks with VPNs; carrier services for WANs; voice and data WANs; and critical WAN implementation issues. Network managers will also present detailed case studies examining the implementation of a government WAN and the use of MAN services. Fee: $1,795 for two-day conference and workshop, $1,295 for conference only, and $795 for one-day workshop. Enquiries — AIC Conferences Tel: (02) 235 1700 Fax: (02) 223 8216.

22-23 **ATM**, Parkroyal Hotel, Darling Harbour, Sydney. A two-day seminar on this very important emergent technology, the program features key industry speakers, and covers a wide variety of topics including the advantages and financial benefits of ATM technology, the availability of ATM products, and the cost of implementation and migration. A case study will also be presented to give attendees a feel for practical ATM implementation. This seminar will also be held in Melbourne on June 28-29. Fee: $1,146. Enquiries — MTE Tel: (02) 261 5555 Fax: (02) 261 5959.

28-30 **Privatising and Financing Telecommunications**, Shangri-La Hotel, Kowloon, Hong Kong. The 1993 Pan-Asian Summit this year focuses on issues of privatisation and increased market competitiveness, covering such topics as how to finance infrastructure projects and industry and market experiences in Asia. The Summit includes case studies from 10 countries in the region, and attendees will gain insights into development policies and market and investment opportunities. There is also a half-day workshop on privatisation policy, planning and practice. Fee: $US1,895. Enquiries —IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

30-1/7 **Creating Business Advantage Through Multimedia**, Sheraton Towers Hotel, Singapore. This conference will cover the strategic role of multimedia, critical inhibiting and enabling factors in the rise of digital technology, the implementation of multimedia communications networks, the emergence of photo CD technology, groupware and more. The Hong Kong Mass Rapid Transport Authority will also be providing a user case study. This event is aimed at managers considering the use of multimedia, providers of multimedia products, and information providers throughout the Asia Pacific region. An exhibition of the latest products and technologies will also be held in conjunction with the conference. Fee: $S1,650. Enquiries — IBC Technical Services Tel: +65-732-1970 Fax: +65-733-5087

July

5-7 **The Pan Asia Optical Fibre Summit '93**, Conrad Hotel, Hong Kong. This conference will deal with key issues in the field of optical fibre technology, including regional government policy for optical fibre development; regional carrier infrastructure and service roll-out plans; commercial opportunities in the Asia Pacific region; and new directions in optical fibre terrestrial and submarine technology. There will be Ministerial presentations from China, Indonesia and the Philippines, and key industry speakers from regional carriers and leading telecommunications product vendors. A special feature will be the Chinese Government's discussion of its privatisation plans. Fee: $US1,595. Enquiries — AIC Conferences Tel: +852-520-1481 Fax: +852-866-7340.

7-9 **The 1993 Pan Asian Mobile Communications Summit**, Singapore. This conference will be held in both Singapore and Hong Kong, and will cover mobile services policy and planning in Asian markets, GSM Asia-Pacific roll out experiences, satellite personal communications, Digital AMPs, JDC and CDMA implementation experiences, and regional developments in Australia, Hong Kong, Singapore, Indonesia, Malaysia, Philippines and Japan. The Hong Kong conference will be held on July 12-14. Fee: $US1,895. Enquiries — IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

12-14 **Network Cabling Design**, Maritime Conference Centre, Sydney. This intensive hands-on seminar is designed for people involved in managing and installing networks, and covers areas such as cabling standards; cable construction, uses and transmission methods; network test equipment; preparing cabling cost estimates; and future cabling trends. The course will also be held in Melbourne later in the year. Fee: $1,445. Enquiries — IIT Training Tel: (02) 959 5990 Fax: (02) 956 6375.

August

4-7 **TUANZ 93**, Ellerslie Function Centre, Auckland. This annual conference and exhibition will be a major event for telecommunications users. Conference sessions will explore the issues, applications and converging technologies that will lead the way to the year 2000. The theme of 'Towards 2000' will be addressed from several perspectives: visionary, business, carrier and Pacific. For the first time the exhibition will be open through to Saturday, to enable those operating small businesses to attend. A series of seminars on Saturday, 7 August will be aimed specifically at the educational sector, and will look at the role of telecommunication in distance education, educational TV and other areas of interest. Fee: $NZ750 (Members), $NZ975 (Non-members). ATUG members are entitled to attend at the member rate. Enquiries — TUANZ Tel: +64-9-488-1602 Fax: +64-9-489-9515.

September

20-22 **Understanding Data Communications Networks**, Maritime Conference Centre, Sydney. This course aims to give professionals working in data communications a thorough grounding in communications protocols and standards, modem terminology and technology, hardware and software interfaces, multiplexers, and transmission media and their uses. Fee: $1,445. Enquiries — ITT Training Tel: (02) 959 5990 Fax: (02) 956 6375.

27-1/10 **ASWEC '93**, Hyatt Kingsgate, Sydney. The 7th Australian Software Engineering Conference has the theme this year of 'Software Quality and Other Urban Myths,' and will feature papers on CASE, development environments, management of software developments and technical innovations. Enquiries — Institution of Radio and Electronics Engineers Australia Tel: (02) 327 4822 Fax: (02) 362 3229.

October

24-27 **The IREE Communications Conference**, Hilton International Hotel, Melbourne. The IREE has announced this new conference, which will replace the former IREECON. This year's inaugural event will have the theme 'Communications: Foundations for the Future,' and will run streams on radiocommunications, telecommunications and industry support. The keynote speaker will be the newly elected Director of the Telecommunications Development Bureau, Mr Arnold Djiwatampu. A highlight of the three day event will be a special 'Hypothetical' session led by John Leaney, Senior Lecturer, University of Technology, Sydney, and featuring a panel of key industry figures. There will also be a trade exhibition of the latest technology and equipment. Enquiries — Tel: (02) 327 4822 Fax: (02) 362 3229.

26-28 **The Inmarsat International Conference and Exhibition on Mobile Satellite Communications**, CNIT, Paris. The first Inmarsat conference and exhibition in 1989 focused on the development of mobile communications. This year the conference will be addressing the future of mobile satellite communications, and senior-level speakers will present their views on a range of issues covering all aspects of the industry. The format will consist of plenary and streamed sessions, and there will also be a series of open forums which will give delegates the opportunity to comment, question and exchange views with industry leaders. The exhibition will show the latest equipment in the field of mobile satellite communications. Enquiries — Tania Starley, IBC Technical Services Tel: +44 71 637 4383 Fax: +44 71 631 3214.

November

28-1/12 **ACOFT-18 '93**, Northbeach Parkroyal Hotel, Wollongong. The 18th Australian Conference on Optical Fibre Technology will cover the latest research, developments, production applications and business strategies of optical fibres, waveguides, sources, detectors and other services for the telecommunications and sensors industries. A trade exhibition will be held in conjunction with the conference. Enquiries — Conference Secretary, IREE Tel: (02) 327 4822 Fax: (02) 362 3229.

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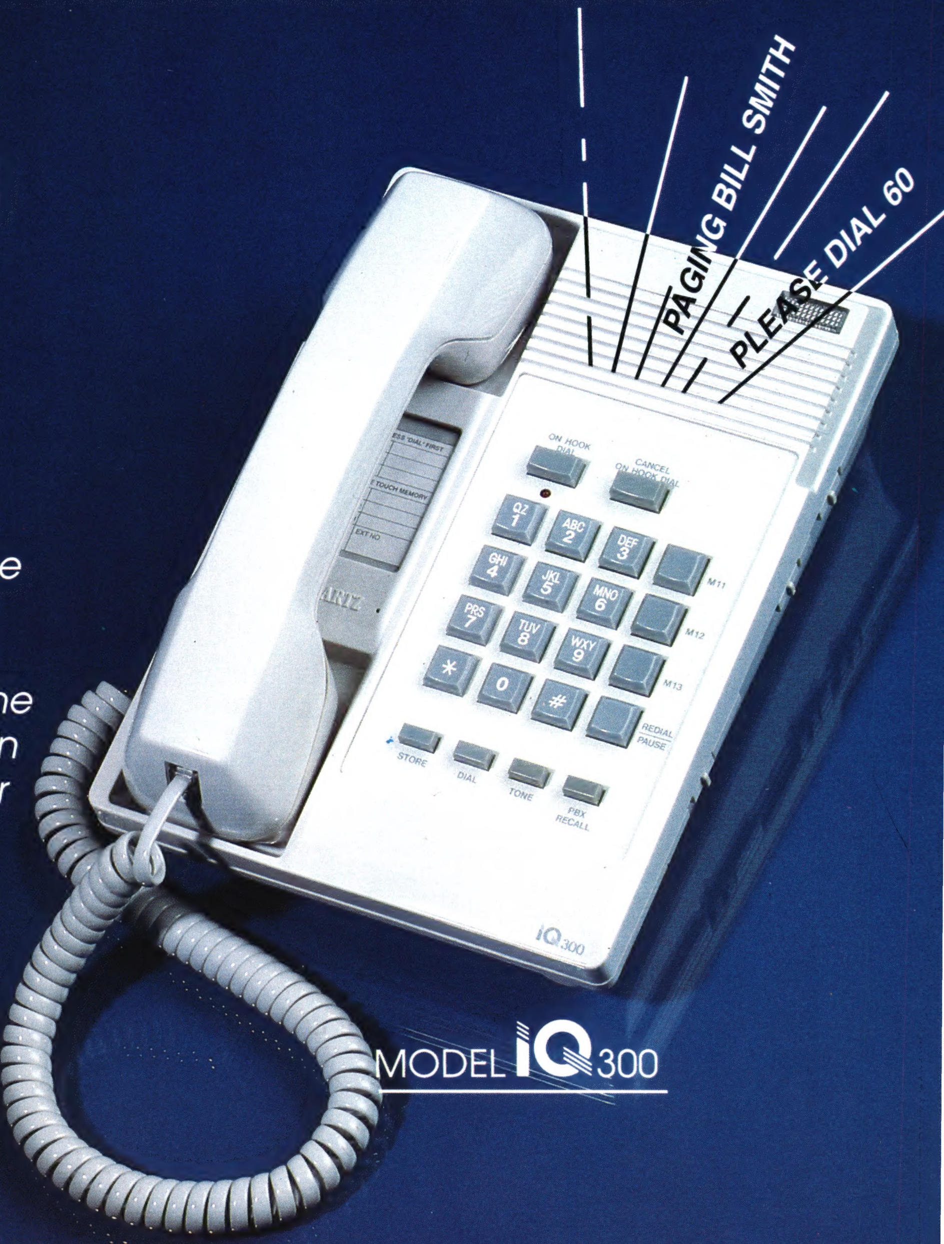

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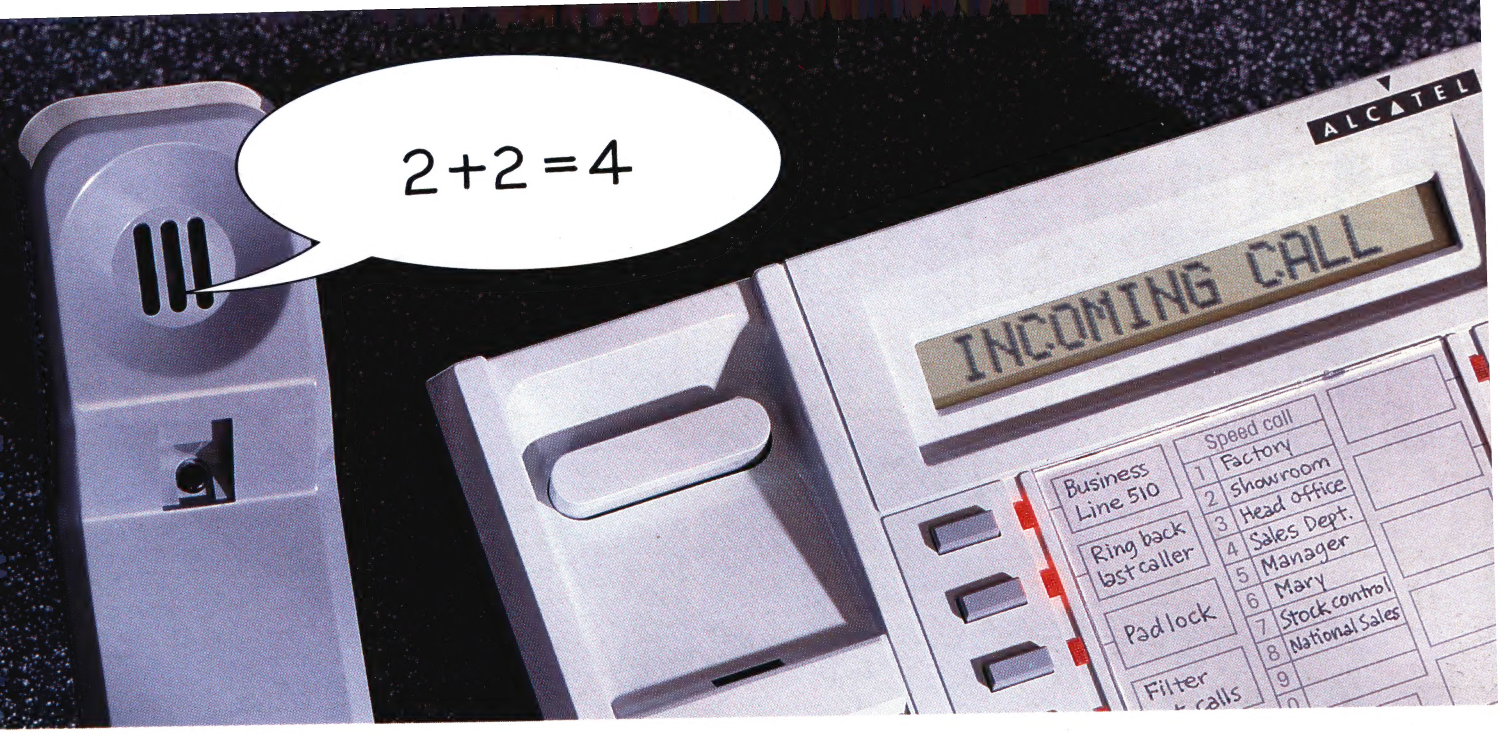

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